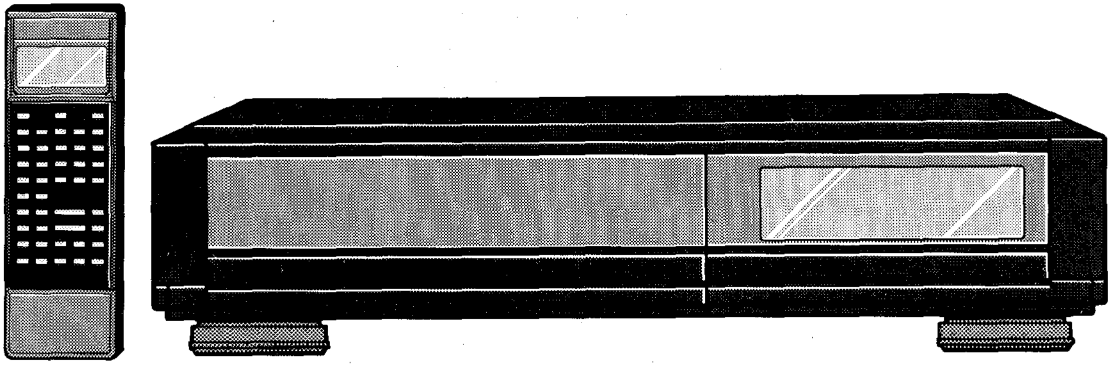
SANYO

Service Technical Information

Color Video Cassette Recorder

VHR-7400 Series **VHR-7800 Series**
VHR-7500 Series **VHR-7900 Series**
VHR-7700 Series (Areas are listed below)
VHR-8500 Series **VHR-8950 Series**
VHR-8700 Series
VHR-8800 Series (Spain, Portugal)

VHR-7400 Series~VHR-7900 Series areas.
(General Europe, U.K, East Europe, U.S.S.R, Middle & Near East, South Africa, Hong Kong, China, Australia, New Zealand)



VHS PAL HQ

Basic Circuit Description

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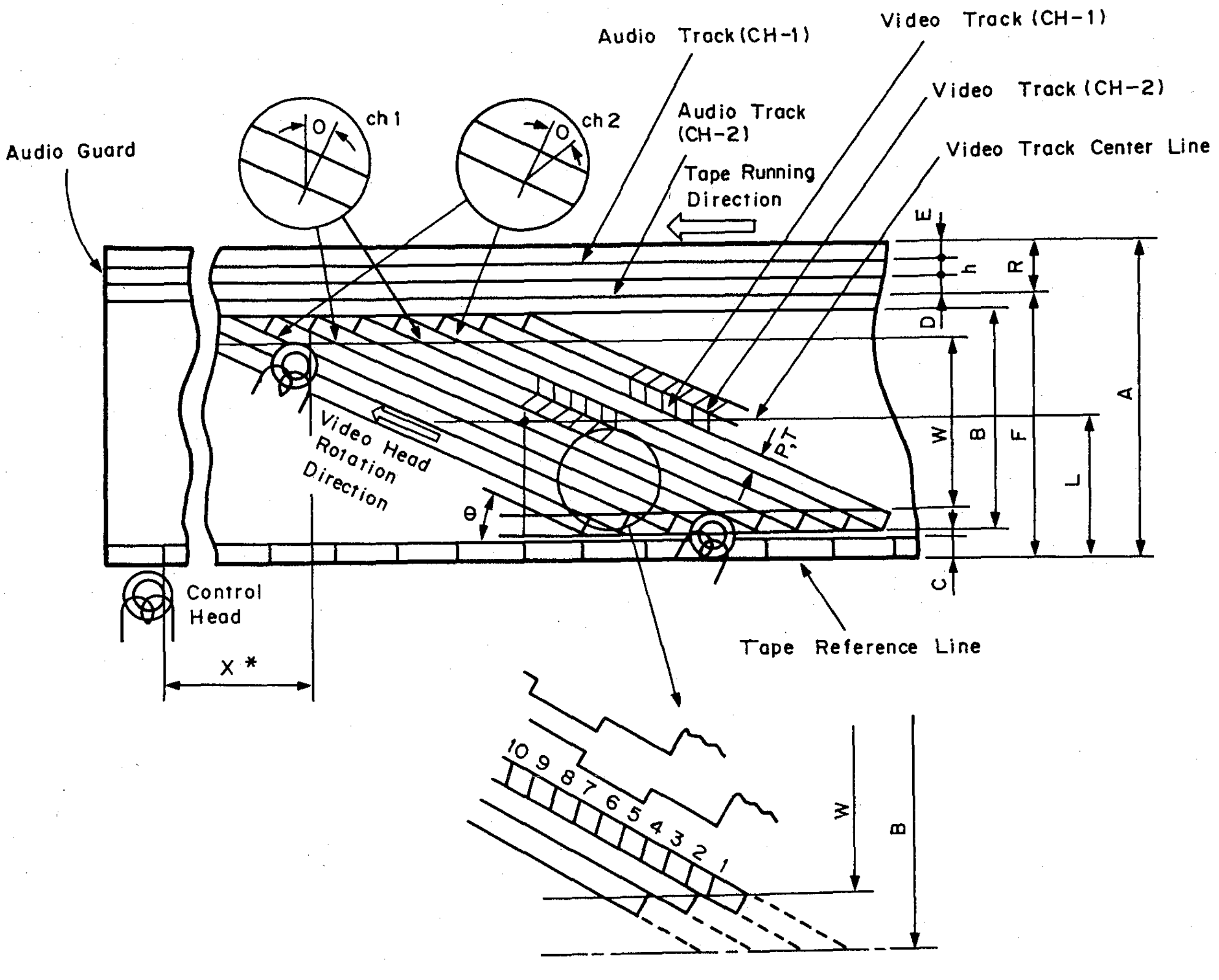
RP3,4/LP2,3,4 Series

REFERENCE No.WM-530744

1. OUTLINE OF VHS PAL FORMAT

1. TAPE PATTERN

The tape format of the VHS-PAL system is shown in Fig. 1


Audio Track (CH-1)
Video Track (CH-1)
Video Track (CH-2)
Video Track Center Line
Audio Guard
ch 1
ch 2
Audio Track (CH-2)
Tape Running Direction
E
h
R
D
W
B
F
A
L
C
P.T.
θ
Video Head Rotation Direction
Control Head
X *
Tape Reference Line
10 9 8 7 6 5 4 3 2 1
W
B

∗ Distance on tape pattern between CH-2 video track 180° exit and CTL signal pulse

Fig. 1 VHS-PAL Tape Format

VHS-PAL Specifications

Nr.	Symbol	Item	Unit	Standard	Remarks
1.	(A)	Tape width	mm	12.65 ± 0.01	
2.	(Vt)	Tape feed speed	mm/sec	23.39 ± 0.5% (SP)	
3.	(ϕ)	Drum diameter	mm	62 ± 0.01	Upper drum
4.	(Vh)	Relative speed	m/sec	4.85	
5.	(P)	Video track pitch	mm	0.049	
6.	(B)	Total video width	mm	10.60	
7.	(W)	Video width	mm	10.07	
8.	(L)	Video track center	mm	6.2	From tape reference edge
9.	(T)	Video track width	mm	0.049	
10.	(C)	Control track width	mm	0.75 ± 0.1	
11.	(R)	Audio track width	mm	1.0 ± 0.1	Single track
12.	(D)	Audio track width	mm	0.35 ± 0.05	CH-2 (R)
13.	(E)	Audio track width	mm	0.35 ± 0.05	CH-1 (L)
14.	(F)	Audio track reference edge	mm	11.65 ± 0.05	From tape reference edge
15.	(h)	Audio guard width	mm	0.3 ± 0.05	
16.	(θ o)	Video track angle		5° 56′ 7.4″	During tape run
17.	(θ)	Video track angle		5° 57′ 50.3″	During tape stop
18.	(α)	Video head azimuth angle		± 6° (± 10′)	
19.	(χ)	Audio and control head position	mm	79.244	
20.		Position of V-SYNC		5~8H	

Table 1

2. THE VIDEO SIGNAL RECORDING SYSTEM (PAL and MESECAM Systems)

2-1. Video Recording Systems

- Luminance signal recording : FM recording
- Color carrier signal :
  PAL : Low-frequency conversion with phase shifting and direct recording
  MESECAM : Low-frequency conversion direct recording

2-2. Recording Signal

CCIR monochrome, PAL and SECAM color TV signals

2-3. Video Signal Recording Frequency Range

- Monochrome luminance signal : 30 Hz to 4.2 MHz
- Composite luminance : 30 Hz to 3.0 MHz

2-4. Preemphasis Characteristics

$$\left.\begin{array}{l} T : 1.3 \pm 0.05\ \mu\text{sec} \\ X : 4 \pm 0.3 \end{array}\right\}\text{slope}$$

2-5. FM Carrier Frequency

WHITE PEAK 4.8 ± 0.1 MHz
SYNC TIP 3.8 ± 0.1 MHz

2-6. FM Carrier Frequency Deviation

1 ± 0.1 MHz

WHITE CLIP level : 160^{+10}_{-5} % from SYNC TIP

DARK CLIP level : 40 ± 10% from SYNC TIP
(Between SYNC TIP and WHITE PEAK is considered as 100%)

2-7. Recording Current Characteristics

FM signal recording amplifier characteristics :

Saturated optimal recording current at frequencies 3.8 MHz or more.

At currents of 2 and 1 MHz, 3 dB ± 1 dB and 6 dB ± 15 dB assuming a current of 3.8 MHz to be 0 dB. Near flat characteristics for 1 MHz or less.

Conversion carrier chroma signal band :
Constant current characteristics

2-8. FM Signal Head Current

± 15 dB or less of optimal recording current of 4 MHz

2-9. Chroma Carrier Signal Conversion Frequency

- PAL : $f_c = 40 \times f_H + 1/8 f_H$ (626.953 Hz)

f_H is horizontal SYNC frequency of input video signal

- MESECAM :
  $f_{CR} = (40 + 1/8)\ f_H + f_o - f_{OR} = 654332$ Hz
  $f_{CB} = (40 + 1/8)\ f_H + f_o - f_{OB} = 810572$ Hz

f_{OR}/f_{OB} is input chroma signal frequency and f_o is local frequency
f_{OR} : 4.406250 MHz
f_{OB} : 4.250000 MHz
f_o : 4.433619 MHz

3. THE CHROMA CARRIER SIGNAL CONVERSION FOR RECORDING

CH-1 (Head azimuth 6° clockwise) Constant and non-varying

CH-2 (Head azimuth 6° counterclockwise) Delayed 90° per horizontal period

The recording carrier chroma signal is phase-switched for each line in a position equal to the horizontal SYNC signal period or to the front porch without disturbing the burst phase.

3-1. The Chroma Carrier Signal Conversion Recording Level

−7 to −10 dB from saturation (at PB output level)

3-2. Time Delay between Luminance (Y) and Converted Carrier Chroma Signals

0.1 μsec or less on video tape

3-3. Video Head response should be identical for the two channels.

4. BASIC BLOCK DIAGRAM OF THE PAL RECORDING SYSTEM

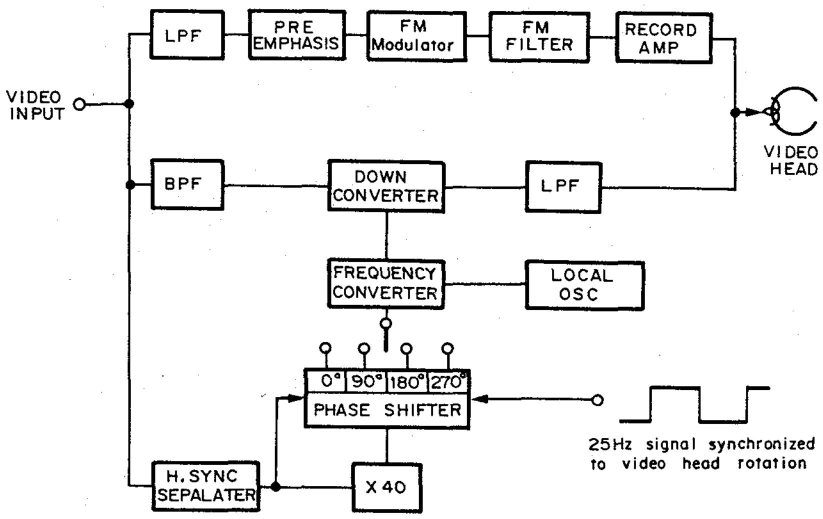

VIDEO INPUT
LPF
PRE EMPHASIS
FM Modulator
FM FILTER
RECORD AMP
VIDEO HEAD
BPF
DOWN CONVERTER
LPF
FREQUENCY CONVERTER
LOCAL OSC
0°
90°
180°
270°
PHASE SHIFTER
H.SYNC SEPALATER
X40
25Hz signal synchronized to video head rotation

Fig. 2

5. THE RECORDING SIGNAL SPECTRUM

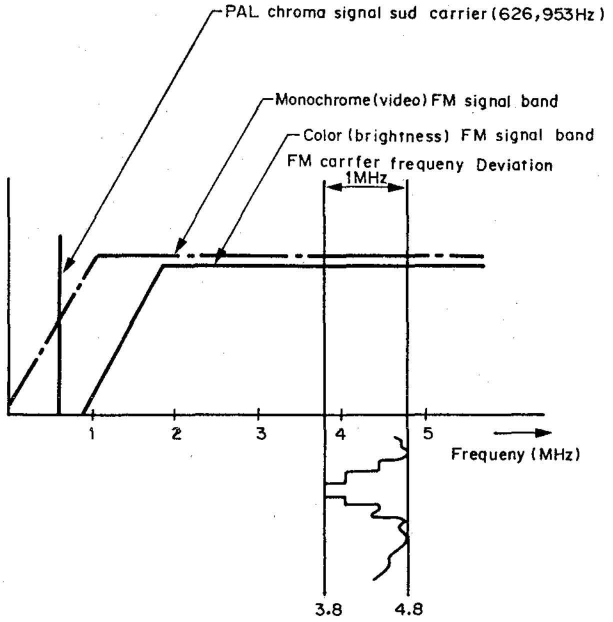


Fig. 3

6. BASIC BLOCK DIAGRAM OF THE MESECAM RECORDING SYSTEM

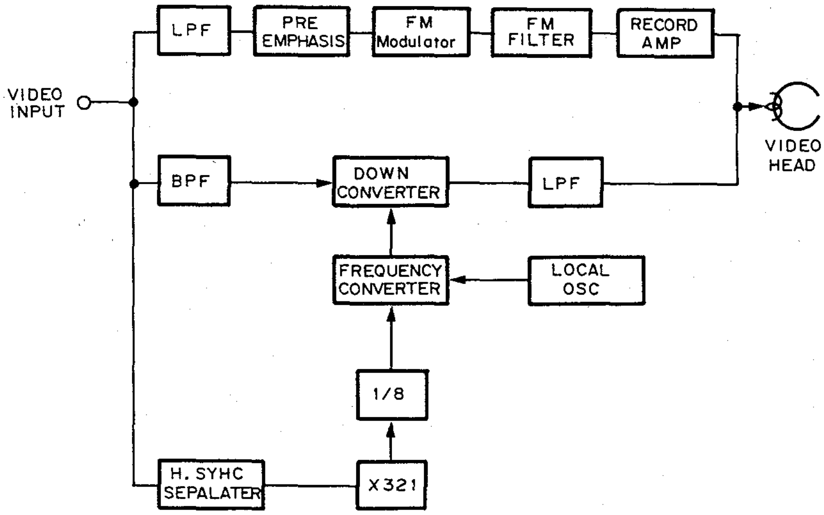

VIDEO INPUT
LPF
PRE EMPHASIS
FM Modulator
FM FILTER
RECORD AMP
VIDEO HEAD
BPF
DOWN CONVERTER
LPF
FREQUENCY CONVERTER
LOCAL OSC
1/8
H. SYHC SEPALATER
X321

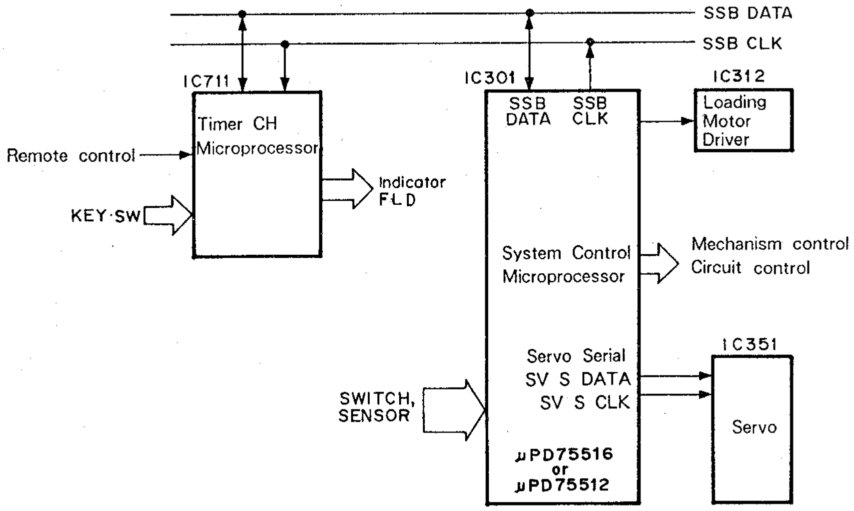
Fig. 4

2. SYSTEM CONTROL CIRCUIT

[OUTLINE]

This system control microprocessor (μPD75516 or μPD75512) is a 4 bit C-MOS IC used for communications with the servo IC and timer channel microprocessor over a serial bus.

[Block Diagram]



SSB DATA
SSB CLK
IC711
Timer CH Microprocessor
Remote control
KEY·SW
Indicator FLD
IC301
SSB DATA
SSB CLK
System Control Microprocessor
Servo Serial
SV S DATA
SV S CLK
μPD75516 or μPD75512
SWITCH, SENSOR
IC312
Loading Motor Driver
Mechanism control
Circuit control
IC351
Servo

Fig. 1

IC301 (μPD75516) SYSTEM CONTROL MPU PIN FUNCTIONS TABLE

NO.	Name	I/O	I/O Signal Function
1	$\overline{\text{TAPE END.S}}$	I	Sensor signal input for tape end detection.
2	A/D REF	I	Reference voltage input for internal A/D conversion circuit. (5 Vdc)
3	VDD		IC power supply input. (5 Vdc)
4	VDD		IC power supply input. (5 Vdc)
5	NOISE ADVANCE P.	O	Pulse for noise band advance in STILL mode.
6	INSERT HIGH	O	"HIGH" output in video signal insert mode. (Models equipped with FE heads.)
7	AF REC	O	"HIGH" output in video signal insert mode, signal to activate FE head.
8	A.DUB	O	"HIGH" output in audio dubbing mode.
9	AUDIO SEL.R	O	Output select signal for stereo audio signals. (ST/L/R/NORMAL).
10	AUDIO SEL.L		
11	INPUT SEL.V	O	Signal for selecting video input signal. (TUNER/EXTERNAL/S.C.)
12	INPUT SEL.A	O	Signal for selecting audio input signal. (TUNER/EXTERNAL/S.C.)
13	S-VHS AUTO/$\overline{\text{OFF}}$	I	S-VHS auto mode selection terminal.
14	BIAS CONTROL	O	Signal for switching full-width erasing head OFF when "HIGH" and ON when "LOW".
15	A REC MUTE	O	Signal to disable output or recording of NORMAL audio.
16	A MUTE	O	Signal to disable audio signal output.
17	NORMAL/$\overline{\text{S-VHS}}$	I	NORMAL (VHS) /S-VHS selection terminal. Normal VHS when "HIGH".
18	$\overline{\text{SV S.DATA}}$	O	Outputs 8-bit × 4 serial data giving operation mode and tracking data, etc., to digital servo IC. CLK is its clock pulse.
19	$\overline{\text{SV S.CLK}}$		
20	4K-PWM	O	Outputs 4 kHz PWM signal for set period at start of high-speed FF/REW.
21	REV HIGH	O	Signal giving skew correction in LP SEARCH mode. (PAL models only)
22	–	–	
23	VD REC	O	Signal indicating recording of video signal in insert mode. (Models equipped with FE head only)
24	FE CONTROL	O	Signal indicating operation of FE head in insert mode. (Models equipped with FE head only)
25	TITL REC	O	Title insert mode indication signal.
26	SPECIAL PLAY	O	Output in special playback modes (R/L-SEARCH, × 2S, STILL, SLOW, F-ADVANCE, A-DUB PAUSE).
27	$\overline{\text{REC}}$	O	Recording indication signal.
28	$\overline{\text{STILL + SLOW}}$	O	"LOW" output in STILL/SLOW mode for control on-screen IC.
29	ANT/$\overline{\text{VIDEO}}$	O	Antenna through or video deck RF output select (Video when LOW).
30	P.B. HIGH	O	Signal indicating playback image output.
31	FF + REW	O	"HIGH" output during FF or REW mode.
32	POWER UP	O	"HIGH" output except when power is off. Indicates that power is ON.
33	GND		IC ground terminal.
34	$\overline{\text{SAFETY SW}}$	I	Input terminal for accidental erasure prevention switch. No operating to recording mode while "LOW" is input.
35	$\overline{\text{SW DATA 3}}$	I	3-bit signal indicating operation position of mechanism.
36	$\overline{\text{SW DATA 2}}$		
37	$\overline{\text{SW DATA 1}}$		
38	–	–	Pull-up (5 Vdc)
39	FL START SW	I	Switch input indicating start of cassette loading or discharge by front mechanism.
40	60 PWM	O	PWM signal output at high speed FF/REW mode.
41	H.SPEED • SEARCH + FF + REW	O	"HIGH" output during SEARCH, FF and REW at high speed mode.
42	AV CONTROL (8PIN)	O	AV terminal (21PIN SOCKET) control signal output.
43	ATR SMPL P	O	Sampling pulse output during auto-tracking operation. (For ATR evaluation)
44	MC-BR	O	Brake signal for capstan motor.
45	MC-F/R	O	Indication signal for capstan motor rotation direction.
46	INSERT $\overline{\text{ON}}$/OFF	I	INSERT function ON/OFF terminal. Function enabled when "LOW".
47	C-FG P.	I	FG pulse input for capstan motor. Signal with frequency of approximately 1 kHz is recognized.
48	T.REEL P.	I	Pulse input for detection of take-up reel table rotation.
49	CTL P.(0/1 CLK)	I	CTL head recording/playback pulse signal input.
50	S.REEL P.	I	Pulse input for detection of supply reel table rotation.
51	$\overline{\text{SSB DATA}}$	I/O	Terminals for communication of mode data with other microprocessors. Data is 8-bit × 12 block serial data.
52	$\overline{\text{SSB CLK}}$	O	The clock pulse is output from this microcomputer.
53	RF SW P.	I	Input of RF switching pulse created by head drum PG.
54	GND	–	IC ground terminal.
55	GND	–	Not used (grounded)
56	–	–	Not used
57	GND	–	IC ground terminal.
58	X1	–	IC clock OSC terminal. Clock frequency is 4 MHz.
59	X2	–	
60	$\overline{\text{RESET}}$	I	Initial reset terminal for IC. Reset when "LOW".
61	0/1 DATA	I	CTL head recording/playback pulse signal input. Used for VISS data detection.
62	ATR $\overline{\text{ON}}$/OFF	I	Auto tracking operation ON/OFF indication signal input. ATR ON when LOW.
63	ENV SW (DOC P.)	I	Video head envelope selection signal input. Used for absorbing (DOC PULSE) STILL noise.
64	–	–	
65	LP HIGH	O	"HIGH" output when tape speed is set to LP mode.
66	LP V • MUTE	O	"HIGH" video mute signal output when tape speed in set to LP mode.
67	–	–	
68	–	–	
69	ML-M	O	Loading motor rotational speed (medium speed) indication signal.
70	ML-L	O	Loading motor rotational speed (low speed) indication signal.
71	ML-R	O	Loading motor rotational direction (REV) indication signal.
72	ML-F	O	Loading motor rotational direction (FWD) indication signal.
73	GND	–	IC ground terminal.
74	JPN/US/PAL	I	Terminal to alter internal specifications for destination areas. (0V input for SP only models, 0.6V input for SP/LP models.)
75	TAPE SPEED	I	Input of result of tape speed determination by digital servo IC.
76	OEM OPTION	I	Terminal to alter internal specifications. (0V input)
77	Hi-Fi ENV	I	AF head envelope detection signal input. (Used for ATR of Hi-Fi models)
78	ENV	I	Video head envelope detection signal input. (Used for ATR)
79	DEW S.	I	Dew sensor input terminal.
80	$\overline{\text{TAPE TOP S.}}$	I	Sensor signal input for tape beginning detection.

Table. 1

IC301 (μPD75512) SYSTEM CONTROL MPU PIN FUNCTIONS TABLE

NO.	Name	I/O	I/O Signal Function
1	TAPE END.S	I	Sensor signal input for tape end detection.
2	A/D REF	I	Reference voltage input for internal A/D conversion circuit. (5 Vdc)
3	VDD		IC power supply input. (5 Vdc)
4	VDD		IC power supply input. (5 Vdc)
5	NOISE ADVANCE P.	O	Pulse for noise band advance in STILL mode.
6	INSERT HIGH	O	"HIGH" output in video signal insert mode. (Models equipped with FE heads.)
7	AF REC	O	"HIGH" output in video signal insert mode, signal to activate FE head.
8	A.DUB	O	"HIGH" output in audio dubbing mode.
9	AUDIO SEL.R	O	Output select signal for stereo audio signals. (ST/L/R/NORMAL).
10	AUDIO SEL.L		
11	INPUT SEL.V	O	Signal for selecting video input signal. (TUNER/EXTERNAL/S.C.)
12	INPUT SEL.A	O	Signal for selecting audio input signal. (TUNER/EXTERNAL/S.C.)
13	–	–	
14	BIAS CONTROL	O	Signal for switching full-width erasing head OFF when "HIGH" and ON when "LOW".
15	A REC MUTE	O	Signal to disable output or recording of NORMAL audio.
16	A MUTE	O	Signal to disable audio signal output.
17	NORMAL/S-VHS	I	NORMAL (VHS) /S-VHS selection terminal. Normal VHS when "HIGH".
18	SV S.DATA	O	Outputs 8-bit × 4 serial data giving operation mode and tracking data, etc., to digital servo IC. CLK is its clock pulse.
19	SV S.CLK		
20	4K-PWM	O	Outputs 4 kHz PWM signal for set period at start of high-speed FF/REW.
21	REV HIGH	O	Signal giving skew correction in LP SEARCH mode. (PAL models only)
22	–	–	
23	VD REC	O	Signal indicating recording of video signal in insert mode. (Models equipped with FE head only)
24	–	–	
25	VISS ON/OFF	I	VISS function ON/OFF terminal. VISS function enabled when "LOW".
26	SPECIAL PLAY	O	Output in special playback modes (R/L-SEARCH, × 2S, STILL, SLOW, F-ADVANCE, A-DUB PAUSE).
27	REC	O	Recording indication signal.
28	STILL + SLOW	O	"LOW" output in STILL/SLOW mode for control on-screen IC.
29	ANT/VIDEO	O	Antenna through or video deck RF output select (Video when LOW).
30	P.B. HIGH	O	Signal indicating playback image output.
31	FF + REW	O	"HIGH" output during FF or REW mode.
32	POWER UP	O	"HIGH" output except when power is off. Indicates that power is ON.
33	GND		IC ground terminal.
34	SAFETY SW	I	Input terminal for accidental erasure prevention switch. No operating to recording mode while "LOW" is input.
35	SW DATA 3	I	3-bit signal indicating operation position of mechanism.
36	SW DATA 2		
37	SW DATA 1		
38	–	–	Pull-up (5 Vdc)
39	FL START SW	I	Switch input indicating start of cassette loading or discharge by front mechanism.
40	–	–	
41	–	–	
42	AV CONTROL (8PIN)	O	AV terminal (21 PIN SOCKET) control signal output.
43	ATR SMPL P	O	Sampling pulse output during auto-tracking operation. (For ATR evaluation)
44	MC-BR	O	Brake signal for capstan motor.
45	MC-F/R	O	Indication signal for capstan motor rotation direction.
46	NOISE PULL OUT ON/OFF	I	NOISE PULL OUT function ON/OFF terminal. Function enabled when "HIGH".
47	C-FG P.	I	FG pulse input for capstan motor. Signal with frequency of approximately 1 kHz is recognized.
48	T.REEL P.	I	Pulse input for detection of take-up reel table rotation.
49	CTL P.(0/1 CLK)	I	CTL head recording/playback pulse signal input.
50	S.REEL P.	I	Pulse input for detection of supply reel table rotation.
51	SSB DATA	I/O	Terminals for communication of mode data with other microprocessors. Data is 8-bit × 12 block serial data. The clock pulse is output from this microcomputer.
52	SSB CLK	O	
53	RF SW P.	I	Input of RF switching pulse created by head drum PG.
54	GND	–	IC ground terminal.
55	GND	–	Not used (grounded)
56	–	–	Not used
57	GND	–	IC ground terminal.
58	X1	–	IC clock OSC terminal. Clock frequency is 4 MHz.
59	X2	–	
60	RESET	I	Initial reset terminal for IC. Reset when "LOW".
61	0/1 DATA	I	CTL head recording/playback pulse signal input. Used for VISS data detection.
62	ATR ON/OFF	I	Auto tracking operation ON/OFF indication signal input. ATR ON when LOW.
63	ENV SW (DOC P.)	I	Video head envelope selection signal input. Used for absorbing (DOC PULSE) STILL noise.
64	–	–	Input terminal for external pause switch.
65	LP HIGH	O	"HIGH" output when tape speed is set to LP mode.
66	LP V-MUTE	O	"HIGH" video mute signal output when in set to LP mode.
67	–	–	
68	–	–	
69	ML-M	O	Loading motor rotational speed (medium speed) indication signal.
70	ML-L	O	Loading motor rotational speed (low speed) indication signal.
71	ML-R	O	Loading motor rotational direction (REV) indication signal.
72	ML-F	O	Loading motor rotational direction (FWD) indication signal.
73	GND	–	IC ground terminal.
74	JPN/US/PAL	I	Terminal to alter internal specifications for destination areas. (0V input for SP only models, 0.6V input for SP/LP models.)
75	TAPE SPEED	I	Input of result of tape speed determination by digital servo IC.
76	OEM OPTION	I	Terminal to alter internal specifications. (0V input)
77	Hi-Fi ENV	I	AF head envelope detection signal input. (Used for ATR of Hi-Fi models)
78	ENV	I	Video head envelope detection signal input. (Used for ATR)
79	DEW S.	I	Dew sensor input terminal.
80	TAPE TOP S.	I	Sensor signal input for tape beginning detection.

Table. 2

[Functions of the System Control Microprocessor]

The system control microprocessor performs functions noted below following the operation key commands sent from the timer microprocessor as serial bus (SSB) signals and various sensor input signals.

(1) Power control

Controls ON/OFF of power supply of the unit.

(2) Various mode operation functions

Operates the main unit according to operation key commands sent from the timer microprocessor as serial bus data (SSB).

(3) Auto functions

① Auto rewind
The unit shifts to the REW mode by the input signal of the tape end sensor.

② Auto play
The unit automatically shifts to the PLAY mode when a cassette tape without a safety lug is loaded.

③ OFF power eject
When the EJECT button is pressed at POWER OFF mode the power is turned off after ejecting the cassette tape.

④ Auto power ON
When a cassette tape is loaded at the POWER OFF mode (FL SW input) the power is automatically turned on.

⑤ Auto eject
When a cassette tape without a safety lug is loaded and the set is turned to the ① auto rewind operation it then automatically ejects the tape upon completion of the rewinding operation.

(4) Timer recording function

The unit is operated according to the program recording conditions set on the timer microprocessor.

(5) Tape speed switching function

① At recording
SP/LP tape speed is revised whenever a new date is fed with the TAPE SPEED key (SSB) through the timer microprocessor and the newly set speed is stored. The effected change is instructed to the servo IC as SV S. data. Also, the serial data (SSB) is sent to the timer microprocessor for display of the tape speed.

② At playing
Tape speed is determined by the input tape speed data fed to Pin 75 discriminated by the servo IC (IC351) then the result is stored. The effected data is then sent to the servo IC and the timer microprocessor in a form of SSB data as in the case of ① recording.

(6) Linear time counter function

① Counting
The time (hour, minute and second) is counted by a method to count each rising of the CTL pulses which are sent from the servo circuit and appears at Pin 49. 25 counts of them are considered as 1 second. However, counter up/down signals are created in the system control microprocessor referring to the operation mode registered in it and the count is either increased or decreased accordingly. The counted data is sent to the timer microprocessor in a form of serial data (SSB) to display it.

② Counter memory
At the counter memory mode, if the counter reading becomes [0 : 00 : 00] at either the REW mode or the FF mode, it shifts to the STOP mode.

(7) Special functions

① Endless play
When a special code (91) is applied at either the STOP mode or the PLAY mode it shifts to the REW mode then it further shifts to the PLAY mode after the sensor detects the tape top. The unit continuously repeats to shift to the PLAY mode and the AUTO REW mode alternately forever.

② Blank search
Blank search represents a function to detect any portion of a tape where no signals are recorded. The operations to detect such a blank portion by detecting existence of CTL pulses can be explained as noted below.
When BLANK key is pressed at either the STOP mode or the PLAY mode it shifts to the FF mode, then 3.5 seconds later it starts detection of CTL pulses at Pin 49.
If no CTL pulses are detected within the first 0.1 second of the FF mode it stays at the same mode for 3.5 seconds further and it shifts to the REW mode.
Detection of CTL pulses starts again after 3.5 seconds of its shifting to the REW mode. If no CTL pulses are detected for 0.1 second it starts to count number of CTL pulses and it shifts to the pseudo CUE mode when more than 5 CTL pulses are detected within 0.1 second.
CTL pulse detection is performed again at the pseudo CUE mode. It shifts to the STOP mode when no CTL pulses are detected for a period of 30 ms.
Upon shifting to the STOP mode it displays remaining tape length and then it pauses waiting for a next command.

(8) Counter GO-TO function

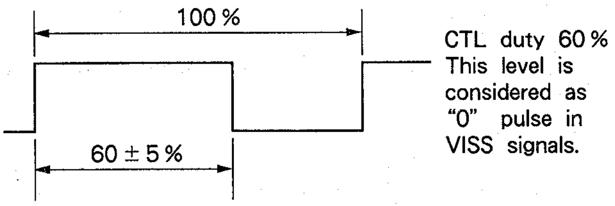
This is an operation to wind up the tape for a desired period set on the linear counter.

For this operation first choose GO-TO mode with SEARCH button of the remote control unit and input winding time to the linear counter through the numerical keys at either the STOP mode or the PLAY mode. Winding (GO-TO) operation starts when either REW button or FF button is pressed after setting a value on the counter. Once the tape winding is started the counter reading decreases from the set value and it stops when the reading becomes [0 : 00 : 00].

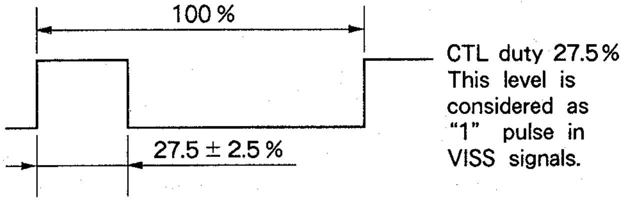
(9) Program search (VISS) functions

On the program search (VISS) system utilized on a VHS video system duty ratio of CTL signals which is to be recorded on the CTL track of a video cassette tape is modified and recorded as a program search (VISS) signal. The VISS signals are then detected at either FF mode or REW mode for fast search of desired program.

- CTL duty at regular recording operation



- CTL duty level while VISS signal is being written.



- Form of VISS signals.

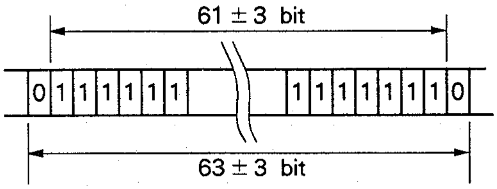


Fig. 2

VISS signals can be written whenever recording a program, and they can be also written at the MARKING mode even after recording a program. Any written VISS signal can be erased at ERASE mode by changing "1" pulses to "0" pulses.

For VISS signal detection, when "1" pulses (CTL duty : 27.5 %) applied to Pin 61 of the 0/1 data terminal are detected for continuous 61 ± 3 bits as indicated in Fig. 2, it is determined as a VISS signal.

① Index scan

At the STOP mode or the PLAY mode, select INDEX mode with SEARCH button of the remote control unit and input the scanning direction with either REW button or FF button. Pressing of TRANS button of the remote control unit after completion of above setting triggers, start the index scan operation. VISS signal detection is performed at the FF mode or the REW mode and the unit shifts to the PLAY mode as soon as the VISS signals are detected. This particular point is named as the index scan find state and the PLAY mode duration time is 5 seconds. Pressing of PLAY key within the above duration time will continuously hold the PLAY mode as it is to quit the index scan mode. But if the key is not pressed, it starts to detect the next VISS signal after the lapse of 5 minutes and a series of operations will be repeated.

② Index search

Until the INDEX mode is selected with the SEARCH buttons of the remote control unit, the operations are same as ① index scan above. For the index search number of VISS pulses to be detected must be fed through the numerical keys. When the scanning direction is selected by either REW button or FF button the index search operation will be commenced by pressing the TRANS button. At each detection of the VISS signals at either mode the preset number is deducted by 1. The index search operation is completed when the display reaches (0) and it shifts to the PLAY mode.

③ Marking operation

The VISS signals are written down whenever the MARK button of the remote control unit is pressed at either the PLAY mode or the REC mode.(Regular CTL "0" pulses are rewritten to "1" pulses.)

This operation is valid only for the cassette tapes with a safety lug.

④ Erase

For erasing a recorded program, select SPECIAL mode on the remote control unit at the PLAY mode and input (10) through the numerical keys. Erase operation starts by pressing of TRANS button. The recorded data is erased when a VISS signal is detected in the search operation.("1" pulses are rewritten to regular CTL "0" pulses.)

This operation is valid only for the cassette tapes with a safety lug.

(10) Tracking control functions

① Outline

The system control microprocessor transmits digital tracking data to the digital servo IC (IC351) as serial SV.S. data. Time lag of the digital tracking is determined in the servo IC referring to the transmitted data and tracking is controlled accordingly.

② Tracking data

Tracking data are divided into main categories noted below :

- Regular play mode data
- Special play mode data for SP speed (SLOW, STILL and F.ADV)
- Special play mode data for LP speed (SLOW, STILL and F.ADV)

  Initialization of the unit is done with above respective data at its center value when the system microprocessor is reset, a cassette is inserted in or the unit is shifted to the REC mode.

③ Manual tracking

When either TRK "+" or TRK "−" key is pressed respective data noted in ② tracking data is revised accordingly, then it is stored and instructed to the servo IC.

④ Auto tracking (ATR) (For PLAY mode only)

- ATR operation starts at either one of the occasions noted below. Namely, when the unit shifts from the STOP mode to the PLAY mode, or when the tape driving speed has changed during play or TRACK key of the remote control unit is pressed during play.
- In order to detect the tracking point head output detection signals (ENV) input at Pin 78 are sampled for 1 full cycle of RF SW pulse as compared with a tracking point checking signal. In the Hi-Fi models A-FM head detection signals (Hi-Fi ENV at Pin 77) also are sampled and compared for this purpose.
- As indicated in the Fig. 3, samplings are done for N times (N = 19) at every 1 ms starting from the trailing edge of the RF SW pulse and also another N times (N = 19) of samplings are performed every 1 ms starting from the next rising edge. All above samplings form 1 full sampling cycle which is to be carried out at every 5 cycles of the RF SW pulses. The sampling is done at 16 bits.

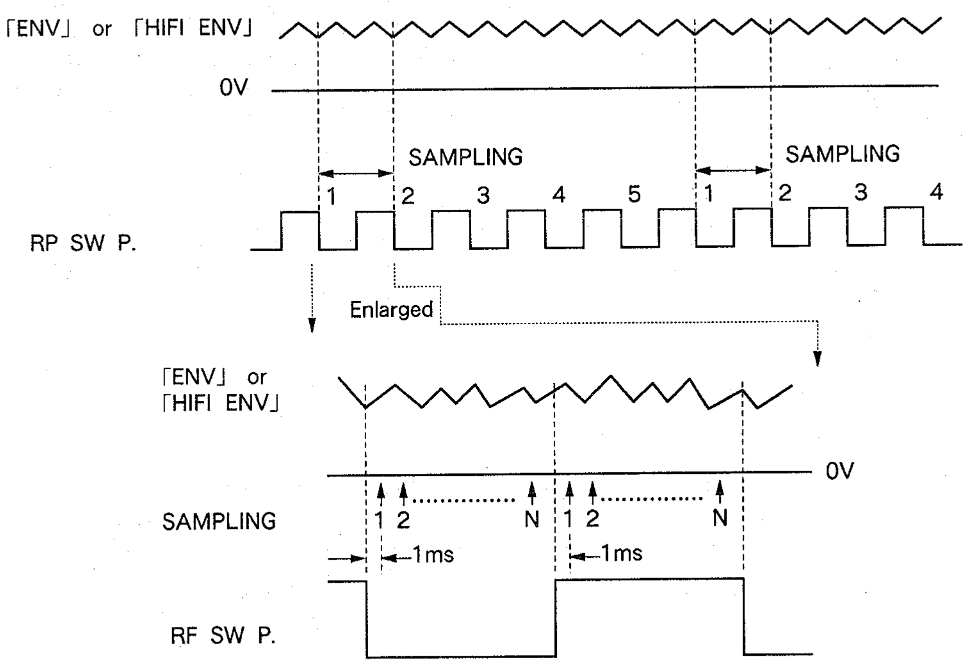


Fig. 3

- For ATR basic operation, after receiving the ATR start command noted above, the tracking position is initialized at its center value and it holds for 2 seconds. Then the ENV sampling data by TRK UP step is compared with each sampling of every TRK step at TRK UP mode. When (n + 1) th sample and (n + 2) th sample are smaller than (n) th sample in a row, it once steps back to the center value. Then next sample comparisons at TRK DOWN step are performed until two samples in row are checked smaller than the previous sample as in the case of TRK UP. The center point of above two data obtained at TRK UP an TRK DOWN is considered as the most ideal tracking position and the data is fed to the servo IC.

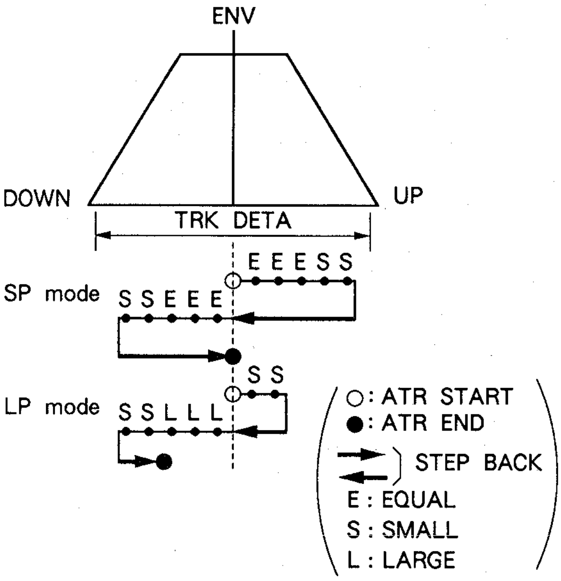


Fig. 4. ATR basic operation

(11) Remaining tape amount calculation and display function

① Outline

"Sum of square of revolution period of both reels" can be calculated referring to the "take-up reel pulse" fed to Pin 48 and the "supply reel pulse" fed to Pin 50. With this data "type of the cassette tape" is determined.

"Remaining length of the cassette tape (indicated in minutes)" is then calculated by "the unique parameter for each tape type" and "the revolution period of both reels" and it is displayed.

② Initial setting (Fig. 5)

- When it is needed to know the remaining length of a tape, it can be calculated by the initial setting of the equipment.
- When the unit is at the STOP mode with a cassette tape loaded in it, a pressing of REMAIN key of the remote control unit starts initial setting.
- Remaining length is calculated in the period of ⓐ and the tape amount run for the calculation during the period ⓐ is rewound in the period of ⓑ.(Counting of the reel pulse number in addition to the calculation of remaining tape reel is also performed in the period of ⓐ.) Remaining length is displayed during the period ⓑ.

③ Constant speed running mode

- Constant speed tape running mode represents PLAY, REC and R/F.SEARCH modes where tape running is controlled by a servo motor.
- At any of above modes, tape remaining length is repeatedly calculated and the value is renewed and stored.
- Remaining length is displayed whenever REMAIN key is pressed.

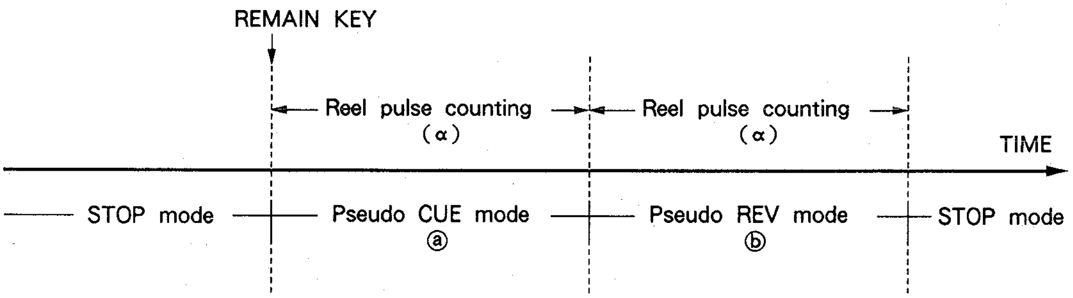


Fig. 5

④ Non-constant speed tape running
- Non-constant speed tape running represents REW mode and F.FWD mode.
- When the tape type is already determined by operations of ② or ③ noted above, remaining tape length is repeatedly calculated and the data is updated time to time and stored. On the other hand, when a new cassette tape is loaded and the initialization step ② is skipped further, the operation of ③ is not performed, if either the REW or the F.FWD is executed, the remaining tape calculation is not performed because the tape type is unknown.

⑤ Setting and determination of a tape type
- Tape type can be either manually set by feeding necessary data through the numerical keys or automatically determined at the constant speed running mode.
- To set manually, load a cassette tape on the unit and press REMAIN key of the remote control unit. At this time, it shifts to the remaining tape display mode and the type number of the tape can be fed through the numerical keys.(Example) : Input "180" for an E-180 tape. The input data is registered only after pressing CH + key following the data input.
- Automatic tape type determination can be done at the constant speed running mode only.
- Tape type is determined by the revolution period of both the supply reel and the take-up reel. The revolution period of the supply reel Ts is calculated by counting the supply reel pulse fed to Pin 50 while that of the take-up reel Tt is calculated by counting the take-up reel pulse fed to Pin 48. Then $K = Ts^2 + Tt^2$ is calculated and it is compared with various tape K values memorized in the microprocessor for determination of the tape type.

Tape speed		Data for tape type manual setting	Tape type
SP	LP		
$143.5 < K \leqq 153.5$	$573.6 < K \leqq 616.0$	210	E-210
		190	E-195
		180	E-180
		Others	E-240
$125.1 < K \leqq 143.5$	$501.1 < K \leqq 573.6$	240	E-240
		210	E-210
		200	E-200
		190	E-195
		170	E-170
		Others	E-180
$107.0 < K \leqq 125.1$	$428.8 < K \leqq 501.1$	200	E-200
		170	E-170
		140	E-140
		Others	E-150
$K \leqq 107.0$	$K \leqq 428.8$	140	E-140
		110	E-110
		100	E-105
		Others	E-120
$185.2 < K$	$741.9 < K$	——	E-90
$167.1 < K \leqq 185.2$	$669.5 < K \leqq 741.9$	——	E-60
$153.5 < K \leqq 167.1$	$616.0 < K \leqq 669.5$	——	E-30

Table. 3

NOTE:

1. "Others" in above chart also include the cases when there are not the tape type determination data by "Data for tape type manual setting".
2. Example
   - $K = 130$ (SP), when data for tape type manual setting = 190 → Tape type = E-195
   - $K = 700$ (LP), when data for tape type manual setting = 200 → Tape type = E-60
   - $K = 550$ (LP), when no data for tape type manual setting → Tape type = E-180

1. COMMUNICATIONS BETWEEN MICROPROCESSOR

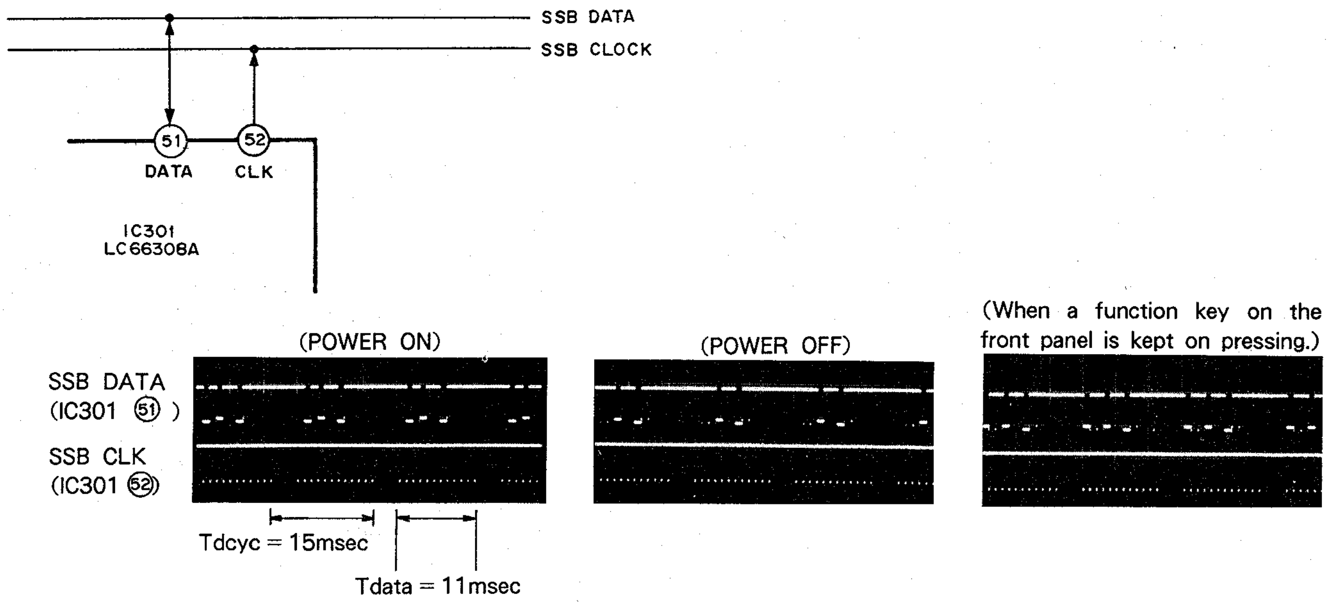
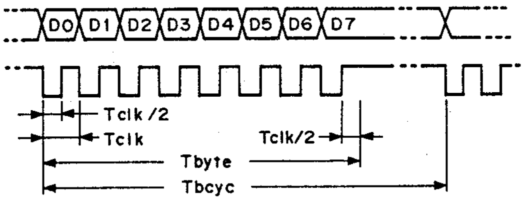

SSB DATA
SSB CLOCK
51
DATA
52
CLK
IC301
LC66308A
(POWER ON)
(POWER OFF)
(When a function key on the front panel is kept on pressing.)
SSB DATA
(IC301 (51))
SSB CLK
(IC301 (52))
Tdcyc = 15msec
Tdata = 11msec

Fig. 6

[Data Format]
Enlarged View


D0
D1
D2
D3
D4
D5
D6
D7
Tclk /2
Tclk
Tclk/2
Tbyte
Tbcyc

Characteristic	Symbol	MAX	TYP	MIN	Unit
Data Cycle Time	Tdcyc	16. 896	15. 360	13. 824	ms
Data Area Width	Tdata	12. 531	11. 392	10. 253	ms
Byte Width	Tbyte	281. 6	128	115. 2	μs
Byte Cycle Time	Tbcyc	1126. 4	1024	921. 6	μs
Clock-pulse Cycle Time	Tclk	35. 2	16	14. 4	μs

2. FUNCTION KEY INPUT (TIMER MICROPROCESSOR IC711)

A scan pulse output from Pins 14 to 57 of IC711 is read at Pins 37 to 34 to judge just which key has now been pressed. The timer microprocessor places the result of key-in operation on SSB data and sends them to the system control microprocessor (IC301) as an operating instruction.

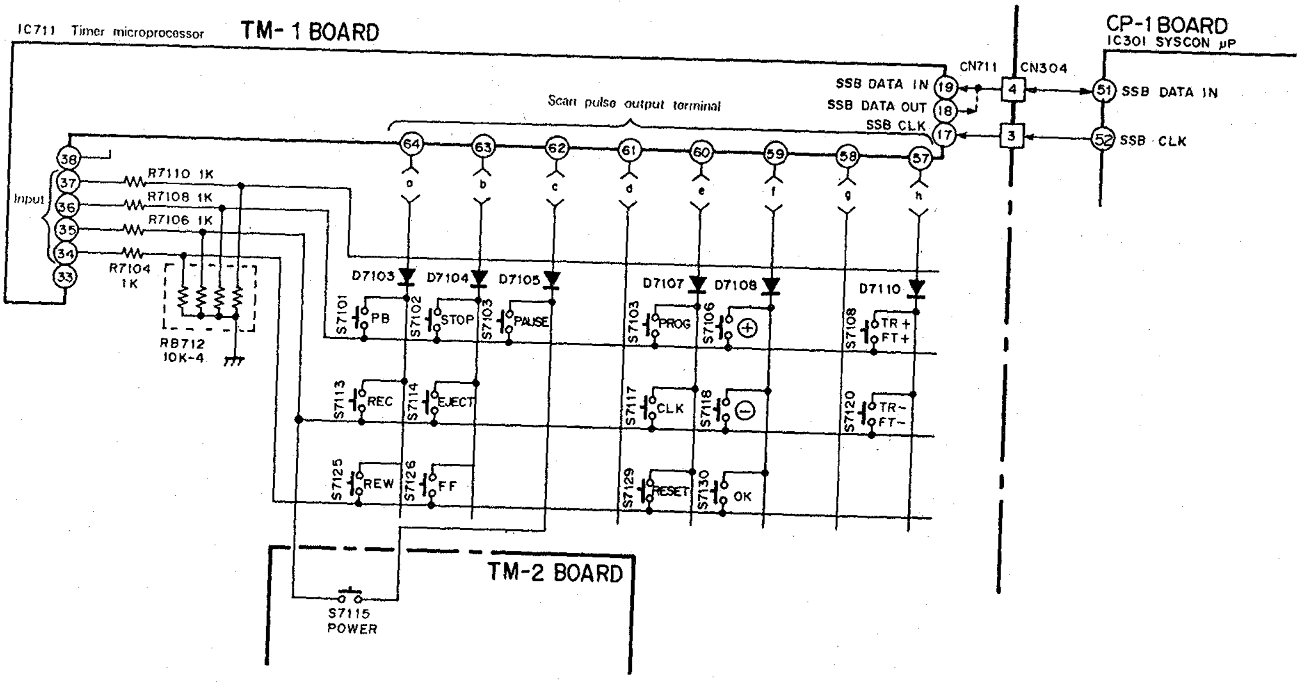

IC711 Timer microprocessor
TM-1 BOARD
CP-1 BOARD
IC301 SYSCON µP
CN711
CN304
SSB DATA IN
SSB DATA OUT
SSB CLK
19
18
17
4
3
51 SSB DATA IN
52 SSB CLK
Scan pulse output terminal
64
63
62
61
60
59
58
57
a
b
c
d
e
f
g
h
Input
38
37
36
35
34
33
R7110 1K
R7108 1K
R7106 1K
R7104 1K
RB712 10K-4
D7103
D7104
D7105
D7107
D7108
D7110
S7101 PB
S7102 STOP
S7103 PAUSE
S7103 PROG
S7106 ⊕
S7108 TR+ FT+
S7113 REC
S7114 EJECT
S7117 CLK
S7118 ⊖
S7120 TR- FT-
S7125 REW
S7126 FF
S7129 RESET
S7130 OK
TM-2 BOARD
S7115 POWER

Fig. 7

3. MECHANISM OPERATION

3-1. INITIALIZE

This operation is to be made at the time of AC plug-in. Move the cassette and the tape to the INITIAL POSITION regardless where they are placed.

↓

Initial position means that the cassette is pulled in and placed down.

(1) To initialize, it is necessary to know the present condition. Therefore, the following must be sensed to begin with.
① Stage position
② Mechanism position

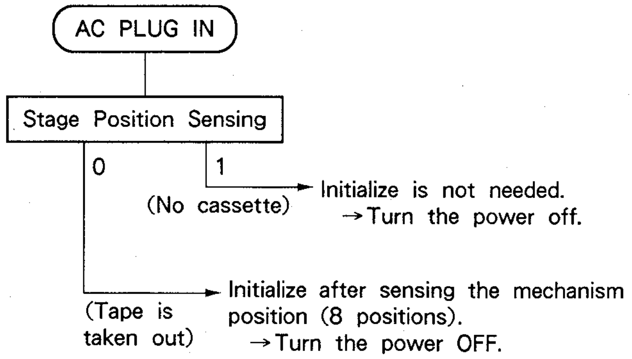
① **Stage position sensing (Position sensed by front loading switch.)**
There are two stage positions, which are expressed as given in the table below.

Stage Position	Status	
	When inserting cassette	When ejecting
0	The cassette is placed down.	
1	No cassette	Upon ejection. (The condition in which the cassette is ejected.)

No sensing of intermediate code is made.

② **Mechanism position sensing (Position sensed by mechanism position switch.)**
The stage 0 position is further classified into eight position.

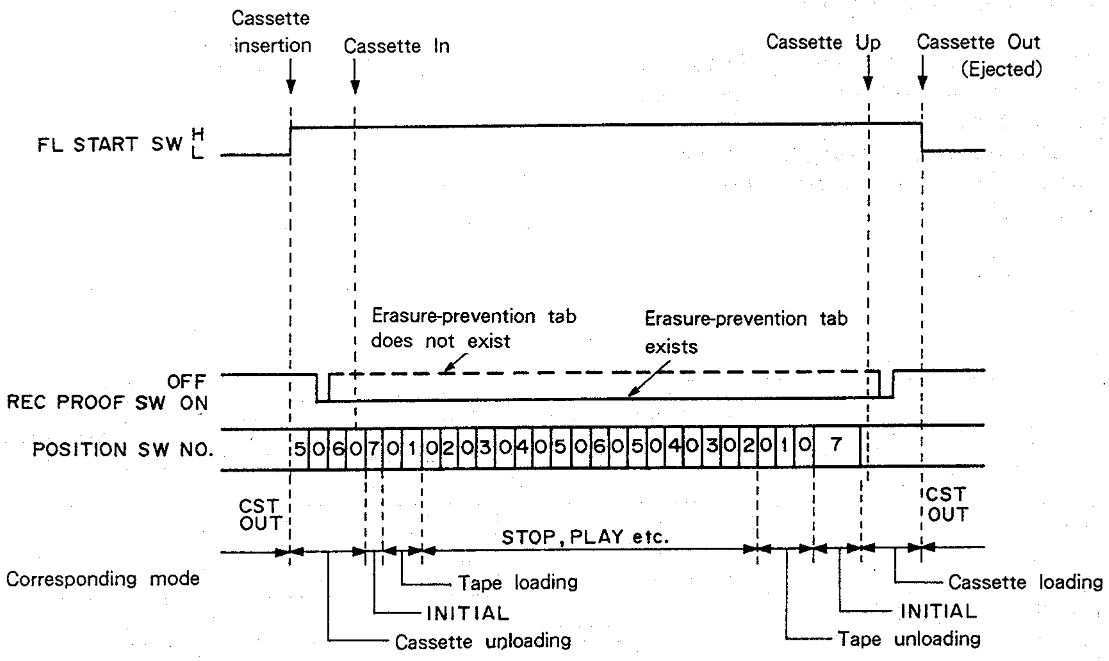
Initialize Flowchart


AC PLUG IN
Stage Position Sensing
0
1
(No cassette)
Initialize is not needed.
→Turn the power off.
(Tape is taken out)
Initialize after sensing the mechanism position (8 positions).
→Turn the power OFF.

Mechanism Positions

Mechanism Position	SW DATA1 IC301 ㊲	SW DATA2 IC301 ㊱	SW DATA3 IC301 ㉟	MODE
0 MIDDLE	H	H	H	Intermediate position while moving
1 BRAKE	L	H	H	Position at which the main brake is applied.
2 STOP	H	L	H	STOP, FF, REW
3 STILL	L	L	H	STILL (PB PAUSE), FRAME ADVANCE
4 PLAY	H	H	L	PB, CUE, REC, REC PAUSE
5 IDLER	L	H	L	Forward and reverse inverting positions (pinch roller is off, and the idler gear is operated with the tape in the loaded state.)
6 REV	H	L	L	REVIEW
7 INITIAL	L	L	L	Initial position (Tape unloading finished state.)

③ Mechanism switch timing

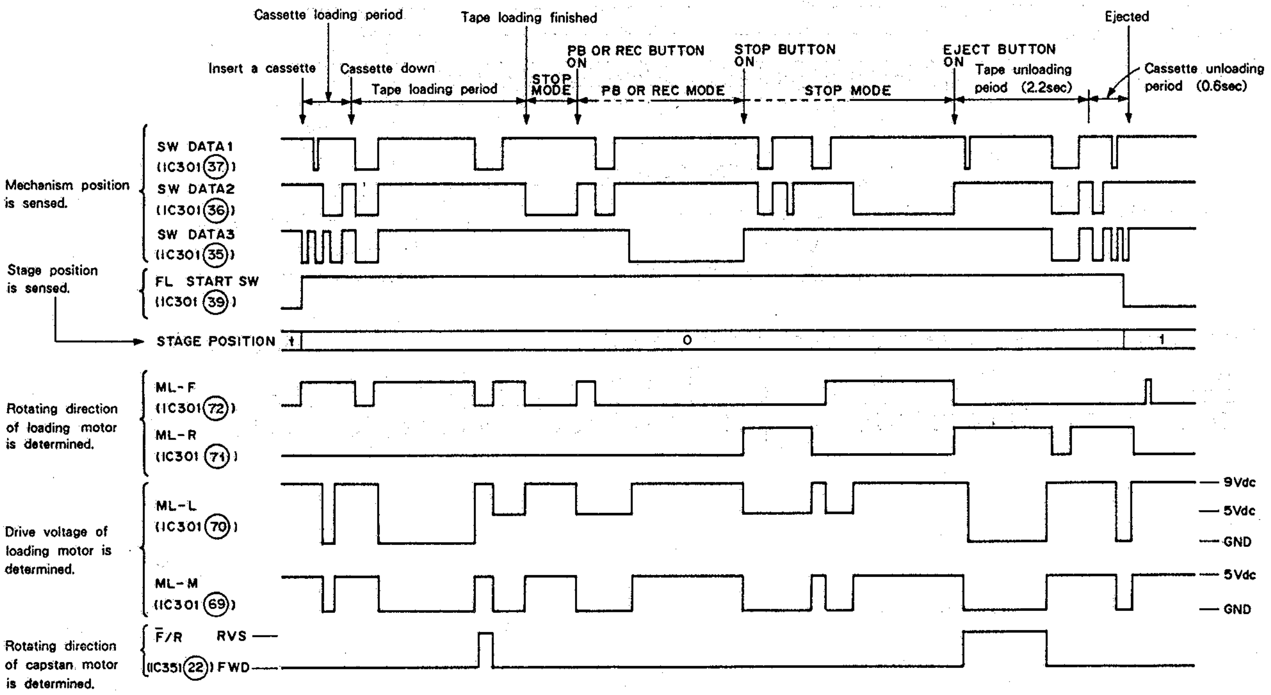

Cassette insertion
Cassette In
Cassette Up
Cassette Out (Ejected)
FL START SW H L
Erasure-prevention tab does not exist
Erasure-prevention tab exists
OFF
REC PROOF SW ON
POSITION SW NO.
5 0 6 0 7 0 1 0 2 0 3 0 4 0 5 0 6 0 5 0 4 0 3 0 2 0 1 0 7
CST OUT
CST OUT
STOP, PLAY etc.
Corresponding mode
Tape loading
INITIAL
Cassette unloading
Cassette loading
INITIAL
Tape unloading

Time taken to move to each position (for references) (Unit : sec)

POS.	7	0	1	0	2	0	3	0	4	0	5	0	6
Time	0.72	1.16	0.12	0.26	0.22	0.16	0.22	0.34	0.14	0.12	0.14	0.14	

3-2. CASSETTE LOADING/UNLOADING AND TAPE LOADING/UNLOADING

When a cassette is inserted, the tape is pulled out and then it has been wound around the drum before this unit is stopped.
The drum motor continues to operate, but it comes to a stop automatically five minutes later if no function key is pressed.


Cassette loading period
Tape loading finished
Ejected
Insert a cassette
Cassette down
Tape loading period
PB OR REC BUTTON ON
STOP MODE
PB OR REC MODE
STOP BUTTON ON
STOP MODE
EJECT BUTTON ON
Tape unloading peiod (2.2sec)
Cassette unloading period (0.6sec)
Mechanism position is sensed.
SW DATA1 (IC301㊲)
SW DATA2 (IC301㊱)
SW DATA3 (IC301㉟)
Stage position is sensed.
FL START SW (IC301㊴)
STAGE POSITION
1
0
1
Rotating direction of loading motor is determined.
ML-F (IC301(72))
ML-R (IC301(71))
Drive voltage of loading motor is determined.
ML-L (IC301(70))
9Vdc
5Vdc
GND
ML-M (IC301(69))
5Vdc
GND
Rotating direction of capstan motor is determined.
F̄/R RVS
(IC351㉒) FWD

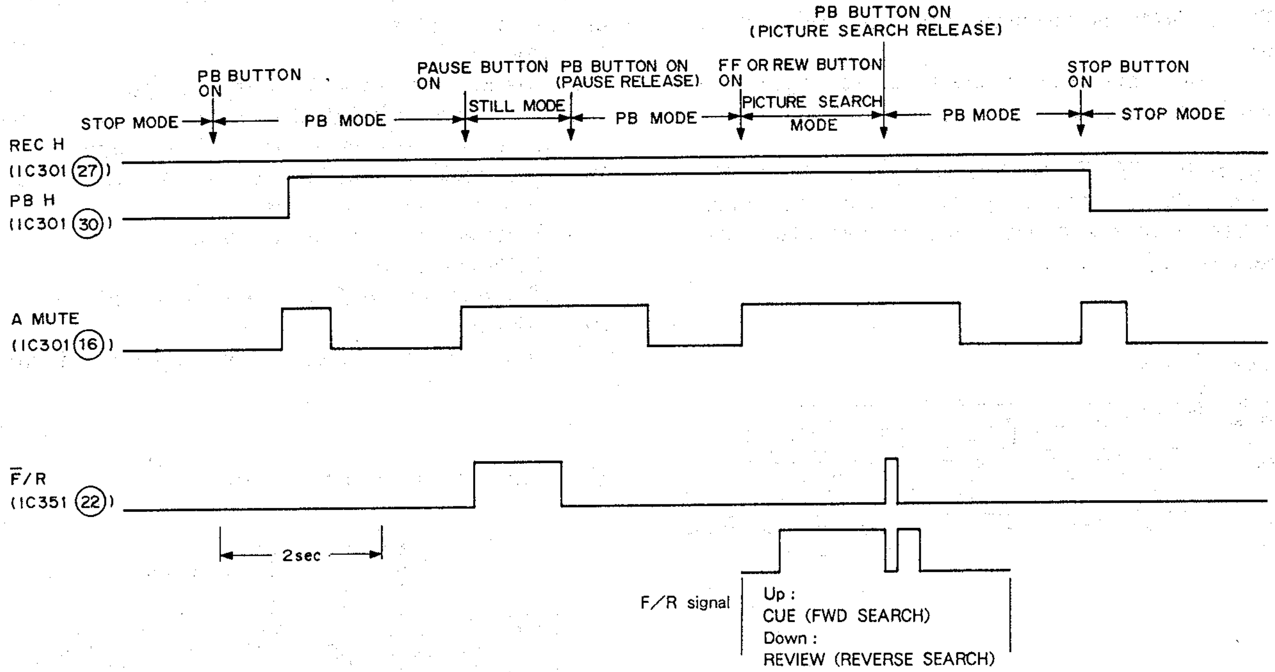
[Cassette Loading]
When a cassette is inserted, the FL SW signal changes from L level to H level. With this change, the microprocessor senses that the cassette has now been inserted. This in turn causes the loading motor to rotate in the forward direction, pulling the cassette in.

[Tape Loading]
As the mechanism mode detecting SW changes to 7, the microprocessor senses that the cassette has now been placed down. This in turn causes the loading motor to rotate in the forward direction and the tape to be pulled out of the cassette for winding on to the drum.

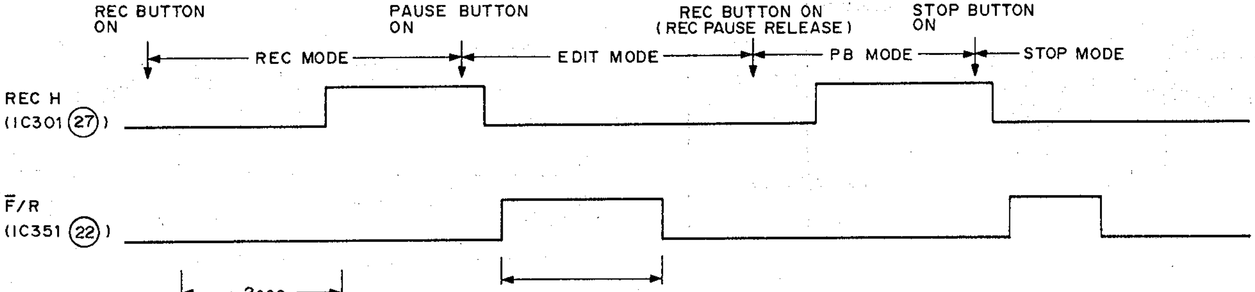
[Tape Unloading]
As the EJECT button is pressed, the loading motor rotates in the reverse direction and takes up the tape into the cassette while the reel table is being turned with the capstan motor.

[Cassette Unloading]
Cassette ejection is sensed by the fact that the loading motor has been rotated in the reverse direction, and that the FL SW signal has changed from H level to L level.

3-3. PB MODE


PB BUTTON ON
(PICTURE SEARCH RELEASE)
PB BUTTON ON
PAUSE BUTTON ON
PB BUTTON ON (PAUSE RELEASE)
FF OR REW BUTTON ON
STOP BUTTON ON
STOP MODE
PB MODE
STILL MODE
PB MODE
PICTURE SEARCH MODE
PB MODE
STOP MODE
REC H (IC301 ㉗)
PB H (IC301 ㉚)
A MUTE (IC301 ⑯)
F̄/R (IC351 ㉒)
2sec
F/R signal
Up :
CUE (FWD SEARCH)
Down :
REVIEW (REVERSE SEARCH)

3-4. REC MODE

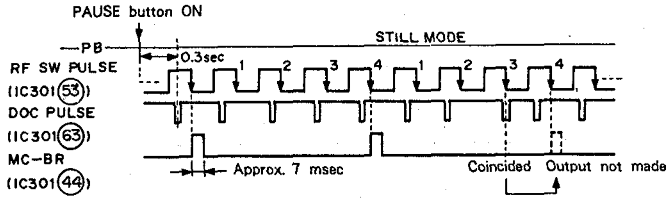

REC BUTTON ON
PAUSE BUTTON ON
REC BUTTON ON (REC PAUSE RELEASE)
STOP BUTTON ON
REC MODE
EDIT MODE
PB MODE
STOP MODE
REC H (IC301 ㉗)
F̄/R (IC351 ㉒)
2sec

The capstan motor rotates in the reverse direction and takes up the tape into the cassette (Max. 3sec)

4. OPERATION OF VARIOUS CIRCUITS

(1) Noiseless STILL (PB PAUSE) ···2Head Model only
When the PAUSE button is pressed during PB mode, the STILL mode is selected, and the still picture appears.
Perform the following operations to obtain a noiseless still picture.

1) When the PAUSE button is pressed during PB mode, detects the drop out pulse, and pulse drives until the capstan motor coincides with falling (⌝L).



2) Pulse drive the capstan motor to make frame advance possible while pushing the PAUSE button during STILL mode.
When pressing the PAUSE button is stopped, the above operation (1) is made, placing the unit in the STILL mode.

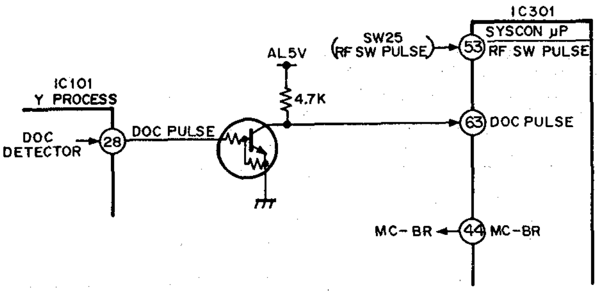
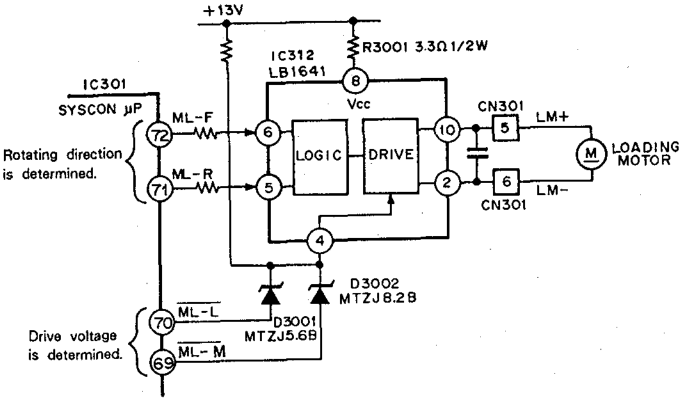

IC101
Y PROCESS
DOC DETECTOR
28
DOC PULSE
AL5V
4.7K
SW25 (RF SW PULSE)
IC301
SYSCON µP
53 RF SW PULSE
63 DOC PULSE
MC-BR
44 MC-BR

Fig. 8

(2) Tracking Control
The tracking circuit consists of an analog tracking circuit and a digital tracking circuit, but the analog tracking circuit is fixed, while the digital tracking circuit is variable.

1) Operation
Change the tracking data with the TRACKING + button or TRACKING − button. The tracking data is available at forty five stages.
2) The tracking data is reset and set to the center in the following cases :
① After microprocessor reset.
② Cassette In.
③ When the REC mode is selected.
3) Display
Tracking data is displayed on the indicator.

(3) Loading Motor Drive Circuit


+13V
R3001 3.3Ω 1/2W
IC312
LB1641
8
Vcc
IC301
SYSCON µP
Rotating direction is determined.
72
ML-F
71
ML-R
6
5
LOGIC
DRIVE
10
2
4
CN301
5
LM+
6
LM−
CN301
M
LOADING MOTOR
D3002
MTZJ8.2B
D3001
MTZJ5.6B
Drive voltage is determined.
70
ML-L
69
ML-M

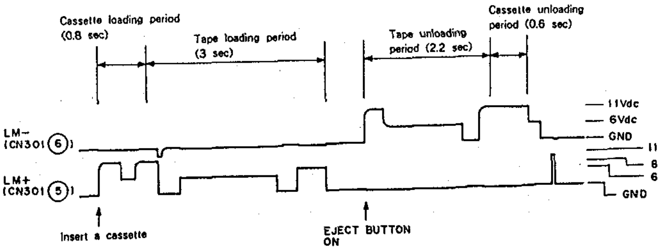


Fig. 9

(4) FF/REW mode Slow Starting

FF/REW operation is done without removing the tape from the drum in this unit, a PWM signal is output at the start of either FF or REW mode to gradually increase the tape running speed.

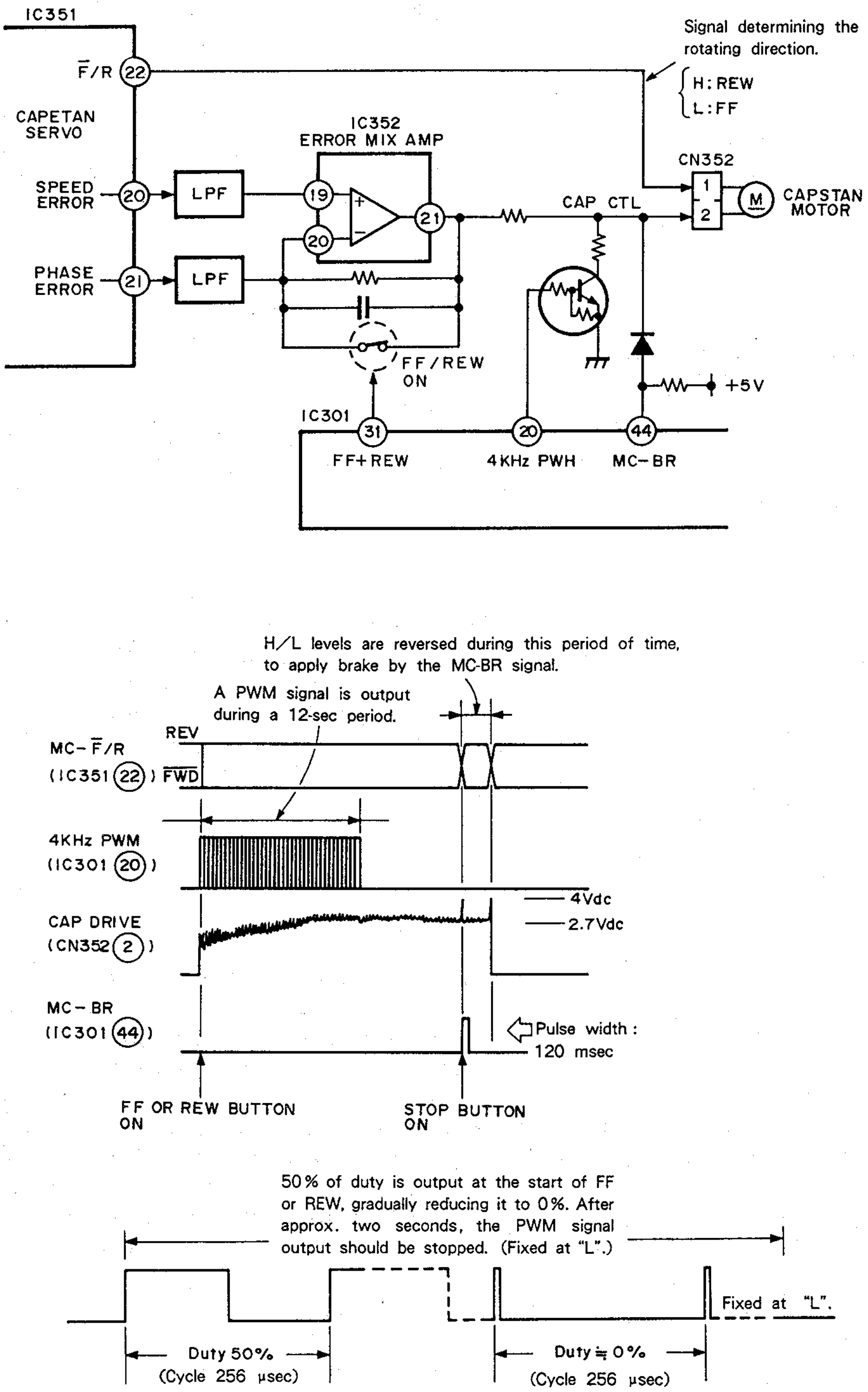

IC351
F̄/R 22
CAPETAN SERVO
SPEED ERROR 20
PHASE ERROR 21
LPF
LPF
IC352
ERROR MIX AMP
19
20
21
FF/REW ON
IC301
31
FF+REW
20
4KHz PWH
44
MC-BR
CAP CTL
+5V
CN352
1
2
M
CAPSTAN MOTOR
Signal determining the rotating direction.
H: REW
L: FF
H/L levels are reversed during this period of time, to apply brake by the MC-BR signal.
A PWM signal is output during a 12-sec period.
REV
FWD
MC-F̄/R (IC351 22)
4KHz PWM (IC301 20)
CAP DRIVE (CN352 2)
4Vdc
2.7Vdc
MC-BR (IC301 44)
Pulse width : 120 msec
FF OR REW BUTTON ON
STOP BUTTON ON
50% of duty is output at the start of FF or REW, gradually reducing it to 0%. After approx. two seconds, the PWM signal output should be stopped. (Fixed at "L".)
Fixed at "L".
Duty 50% (Cycle 256 μsec)
Duty ≒ 0% (Cycle 256 μsec)

Fig. 10

5. PROTECTION CIRCUIT

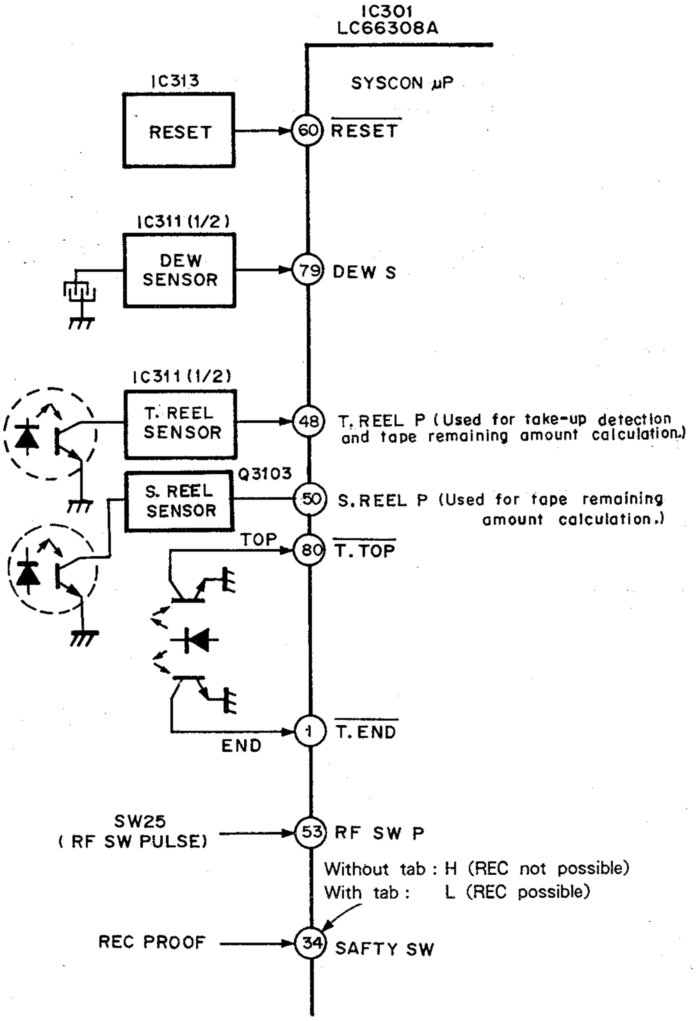

IC301
LC66308A
SYSCON µP
IC313
RESET
60
RESET
IC311 (1/2)
DEW SENSOR
79
DEW S
IC311 (1/2)
T. REEL SENSOR
48
T. REEL P (Used for take-up detection and tape remaining amount calculation.)
S. REEL SENSOR
Q3103
50
S. REEL P (Used for tape remaining amount calculation.)
TOP
80
T. TOP
END
1
T. END
SW25
(RF SW PULSE)
53
RF SW P
Without tab : H (REC not possible)
With tab : L (REC possible)
REC PROOF
34
SAFTY SW

Fig. 11

(1) Microprocessor reset circuit
This circuit outputs a reset signal and resets each microprocessor upon insertion of the AC plug into the plug receptacle.

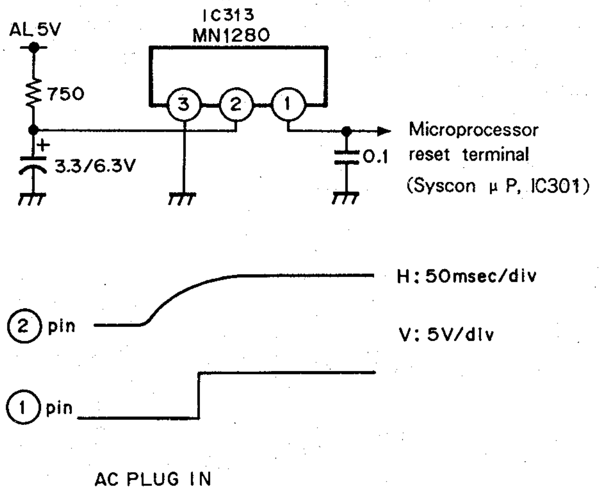

AL5V
IC313
MN1280
750
3.3/6.3V
3
2
1
0.1
Microprocessor reset terminal
(Syscon µ P, IC301)
H: 50msec/div
V: 5V/div
2 pin
1 pin
AC PLUG IN

Fig. 12

A reset circuit is also incorporated in the timer/tuning microprocessor, but its operation is almost the same as described above.

(2) Dew sensor

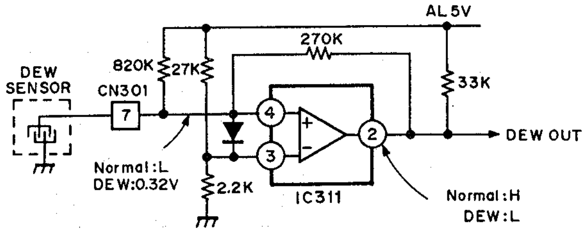

AL5V
270K
DEW SENSOR
820K
27K
CN301
7
4
3
2
+
−
33K
DEW OUT
Normal:L
DEW:0.32V
2.2K
IC311
Normal:H
DEW:L

Fig. 13

The impedance of the dew sensor is normally 0 Ω. The voltage at Pin 4 is therefore 0V. When dew is sensed, and the impedance of the dew sensor gradually increases (in excess of 20 kΩ). The voltage at Pin 4 reaches or exceeds 0.32V as a result. The comparator is now inverted from H to L, and the system control microprocessor judges the presence of a dew. A diode is provided for protection because the withstand voltage of the dew sensor is so low as below 1V.

(3) Take-up reel sensor

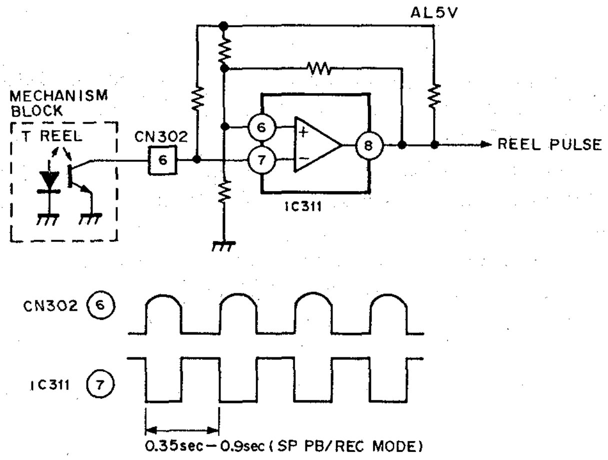

AL5V
MECHANISM BLOCK
T REEL
CN302
6
6
7
8
REEL PULSE
IC311
CN302 ⑥
IC311 ⑦
0.35sec–0.9sec (SP PB/REC MODE)

Fig. 14

The rotation of the reel table is sensed on the tape take-up side only. In the FF, REW, or PICTURE SEARCH (CUE, REVIEW) mode, a pulse does not exist for one second. Also in the REC or PB mode, a pulse does not exist for 2.5 sec. Therefore, the mode moves over to the STOP mode. In the FF or REW mode during a PWM signal is output, the rotation of the reel table is not sensed, however.

(4) Tape top/end sensor

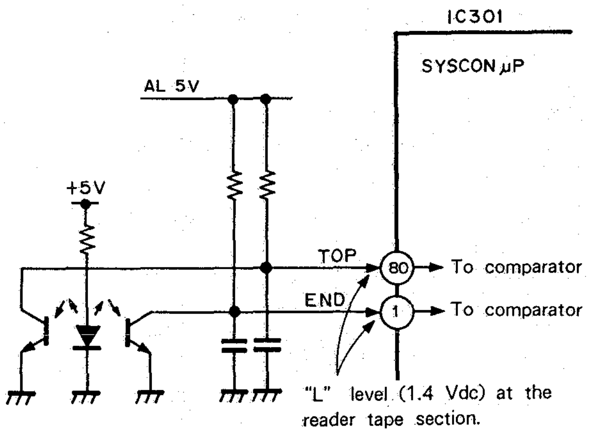
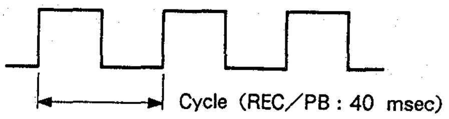

IC301
SYSCON μP
AL 5V
+5V
TOP
END
80
1
To comparator
To comparator
"L" level (1.4 Vdc) at the reader tape section.

Fig. 15

When the tape reaches the top (beginning of tape) or the end (at the end of tape), the transparent reader tape section appears.
When this section appears, the photo transistor is turned ON, so that the input terminals (Pins 80, 1) of the system control microprocessor are forced "L" (approx. 1.4 Vdc).

(5) Drum Rotation Sensing (Pin 53)

The presence and absence of a SW 25 signal (RF SW pulse) is sensed, and when the cycle is in excess of 300 msec, the drum rotation is judged faulty. The operation therefore stops.


Cycle (REC/PB : 40 msec)

(6) REC proof switch

This switch senses the presence and absence of the erase protection tab of the cassette for preventing data from being recorded on the tape during the REC mode of operation.
When the tab exists, Pin 34 does recording at "L", but when the tab is not bent, it becomes "H", which makes recording impossible.

(7) Mode timer

If the same mode is continuously maintained, the mode changes as given below by the internal timer.

Current mode	Mode to be changed to	Timer
PB PAUSE	STOP	5 min
REC PAUSE	STOP	5 min
Cassette loading	Cassette unloading	2.5 sec
Cassette unloading	Cassette loading	2.5 sec
Tape loading	Tape unloading	4.5 sec
Tape unloading	POWEER OFF	4.5 sec

Note: This unit shows a playback picture very quickly during STOP→PB mode. Therefore, the drum motor is rotated even during STOP mode. But the drum motor stops if this continues for more than five minutes.

3. SERVO CIRCUIT

[OUTLINE]

The digital servo IC (LC7418) is a C-MOS LSI containing ROM. It operates in a wide variety of modes with ROM address specified based on the data from the system control circuit.

[Major Functions]

- Drum system speed and phase servo control.
- Capstan system speed and phase servo control.
- Phase servo reference signal generation.
- Mode control according to 16 bit serial data.
- Playback time tape speed automatic discrimination (SP/LP).
- Special playback time control. (FG frequency division and pseudo VD signal, etc.)
- Digital tracking control.
- Hi-fi audio head select signal generation.
- Frame advance (STILL/SLOW) control.

[Block Diagram]

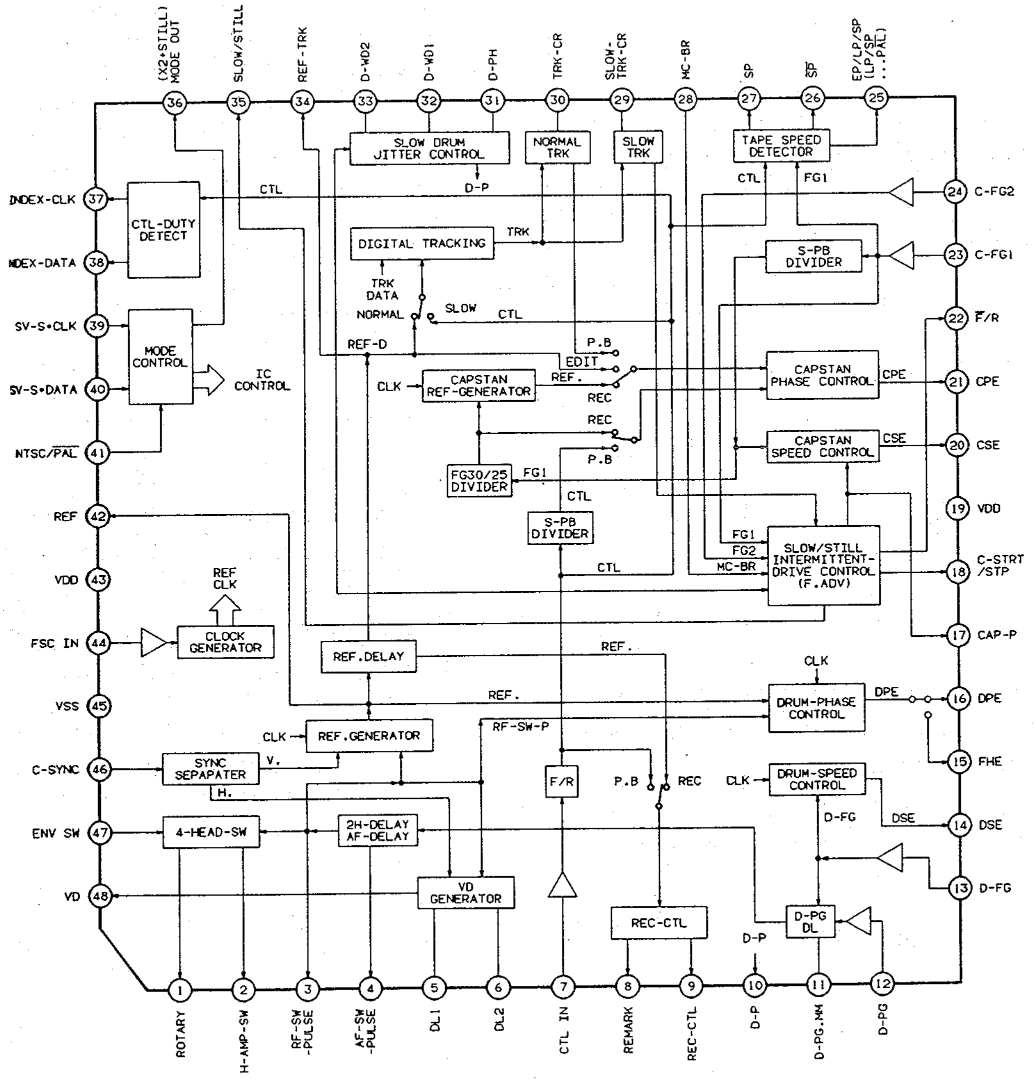
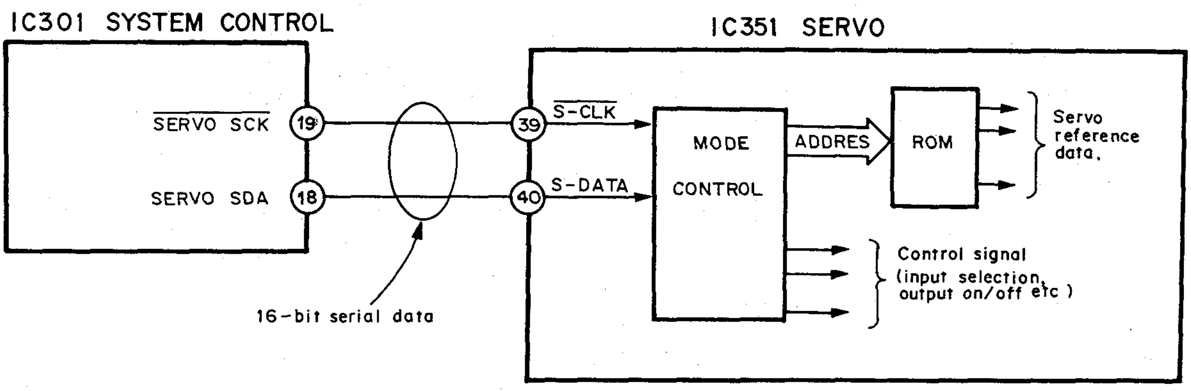

(X2•STILL) MODE OUT
SLOW/STILL
REF-TRK
D-WD2
D-WD1
D-PH
TRK-CR
SLOW-TRK-CR
MC-BR
SP
SP
EP/LP/SP (LP/SP ...PAL)
36
35
34
33
32
31
30
29
28
27
26
25
SLOW DRUM JITTER CONTROL
D-P
NORMAL TRK
SLOW TRK
TAPE SPEED DETECTOR
CTL
FG1
INDEX-CLK 37
INDEX-DATA 38
SV-S•CLK 39
SV-S•DATA 40
NTSC/PAL 41
REF 42
VDD 43
FSC IN 44
VSS 45
C-SYNC 46
ENV SW 47
VD 48
CTL-DUTY DETECT
MODE CONTROL
IC CONTROL
CTL
DIGITAL TRACKING
TRK
TRK DATA
NORMAL
SLOW
CTL
REF-D
P.B
EDIT
REF.
REC
REC
P.B
CLK
CAPSTAN REF-GENERATOR
FG30/25 DIVIDER
FG1
CTL
S-PB DIVIDER
CTL
REF CLK
CLOCK GENERATOR
REF.DELAY
REF.
REF.
CLK
REF.GENERATOR
RF-SW-P
SYNC SEPAPATER
V.
H.
4-HEAD-SW
2H-DELAY AF-DELAY
VD GENERATOR
F/R
P.B
REC
REC-CTL
D-P
24 C-FG2
23 C-FG1
S-PB DIVIDER
22 F/R
CAPSTAN PHASE CONTROL
CPE
21 CPE
CAPSTAN SPEED CONTROL
CSE
20 CSE
19 VDD
FG1
FG2
MC-BR
SLOW/STILL INTERMITTENT-DRIVE CONTROL (F.ADV)
18 C-STRT /STP
17 CAP-P
CLK
DRUM-PHASE CONTROL
DPE
16 DPE
15 FHE
CLK
DRUM-SPEED CONTROL
D-FG
DSE
14 DSE
13 D-FG
D-PG DL
1 ROTARY
2 H-AMP-SW
3 RF-SW -PULSE
4 AF-SW -PULSE
5 DL1
6 DL2
7 CTL IN
8 REMARK
9 REC-CTL
10 D-P
11 D-PG.MM
12 D-PG

Fig. 1.

1. MODE CONTROL

Reference data corresponding to various operation modes (STOP, REC, PB, REW, F.FWD, etc.) and various control signals (CAPSTAN FWD/RVS, DRUM ON, TAPE SPEED, etc.) are read by 16 bit serial data from the system control circuit for control of the servo circuit.

Further, the 16-bit serial data contains the tracking data for digital tracking control, and the F ADV command data for controlling of frame advancing in the slow/still mode.


IC301 SYSTEM CONTROL
IC351 SERVO
$\overline{\text{SERVO SCK}}$
SERVO SDA
19
18
39
40
$\overline{\text{S-CLK}}$
S-DATA
MODE
CONTROL
ADDRES
ROM
Servo reference data.
Control signal (input selection, output on/off etc)
16-bit serial data

PB SP MODE

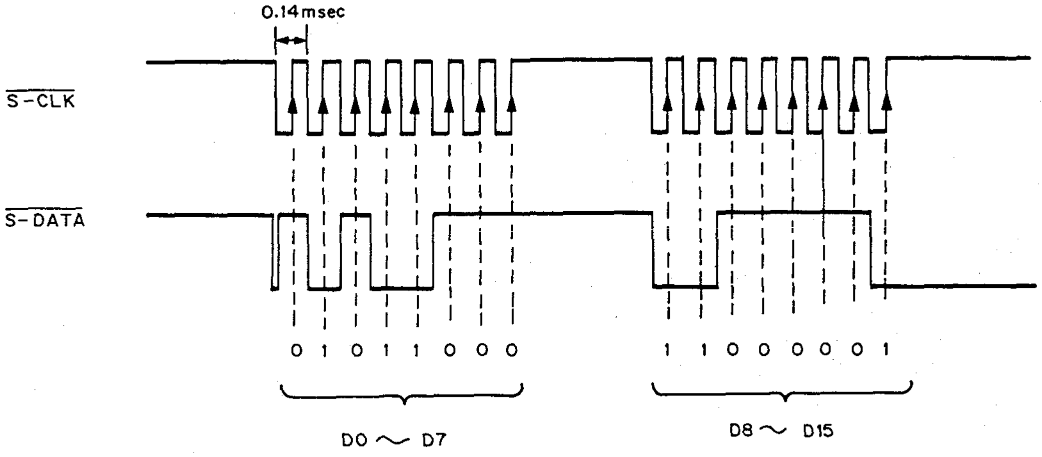

0.14msec
$\overline{\text{S-CLK}}$
$\overline{\text{S-DATA}}$
0 1 0 1 1 0 0 0
1 1 0 0 0 0 0 1
D0 ~ D7
D8 ~ D15

Fig. 2.

2. DRUM SERVO

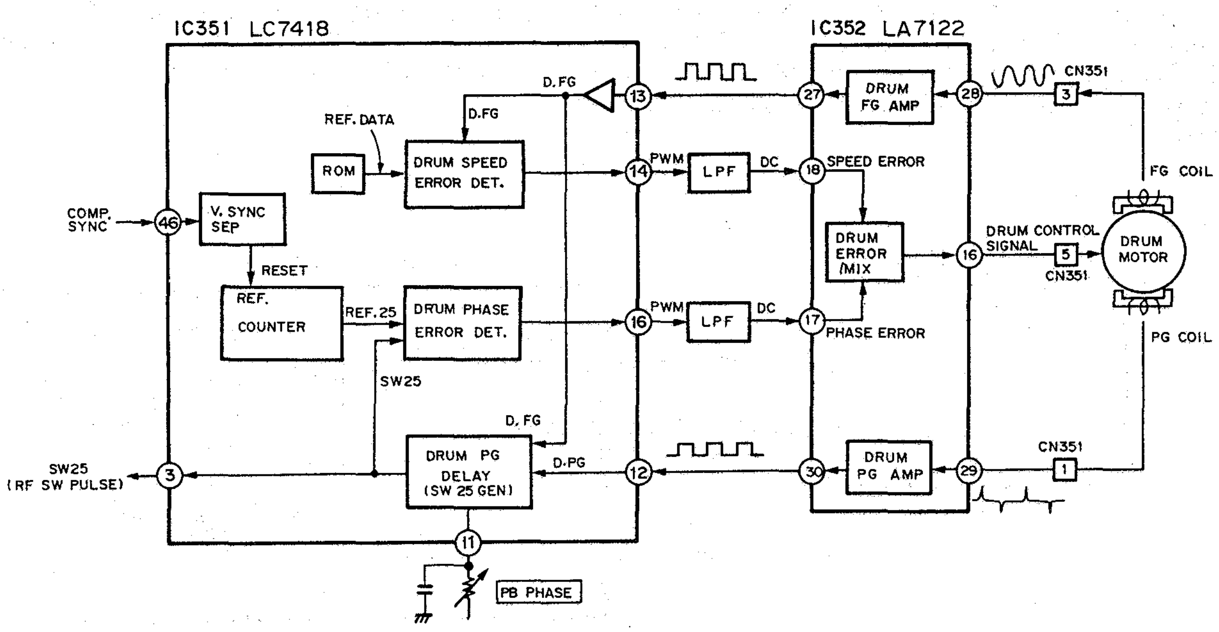

IC351 LC7418
IC352 LA7122
D.FG
REF. DATA
D.FG
ROM
DRUM SPEED ERROR DET.
PWM
LPF
DC
SPEED ERROR
COMP. SYNC
V. SYNC SEP
RESET
REF. COUNTER
REF.25
DRUM PHASE ERROR DET.
PWM
LPF
DC
PHASE ERROR
SW25
D. FG
DRUM PG DELAY (SW 25 GEN)
D-PG
SW25 (RF SW PULSE)
PB PHASE
DRUM FG AMP
DRUM ERROR /MIX
DRUM PG AMP
CN351
FG COIL
DRUM CONTROL SIGNAL
DRUM MOTOR
CN351
PG COIL
CN351
46
3
11
12
13
14
16
27
18
16
17
30
28
29
3
5
1

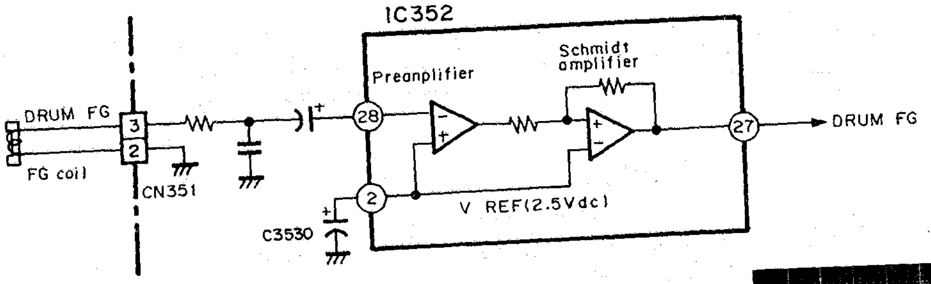
Fig. 3.

[Drum Speed Error]
A speed error is detected by measuring the drum FG signal fed to Pin 13 and output to Pin 14 by the PWM signal.

[Drum Phase Error]
A SW25 signal is generated by a combination of the drum FG signal fed to Pin 13 and the drum PG signal fed to Pin 12 to compare the phase of the REF25 signal received from the reference counter. This SW25 signal is then output to Pin 16 by the PWM signal.
The reference counter, incidentally, is synchronized with the vertical sync signal during REC operation.

2-1. DRUM FG AMPLIFIER

The drum FG amplifier shapes the drum FG signal (30 waves/rotation = 750 Hz) generated at the drum FG coil to the waveform of a rectangular wave.


IC352
Schmidt amplifier
Preanplifier
DRUM FG
3
2
FG coil
CN351
28
27
DRUM FG
2
V REF(2.5Vdc)
C3530

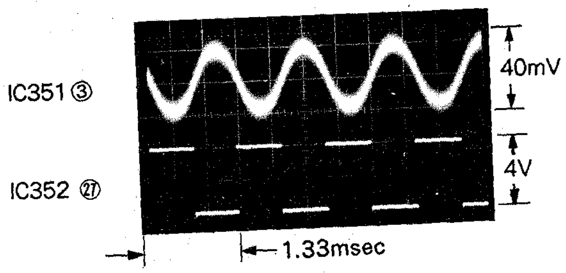
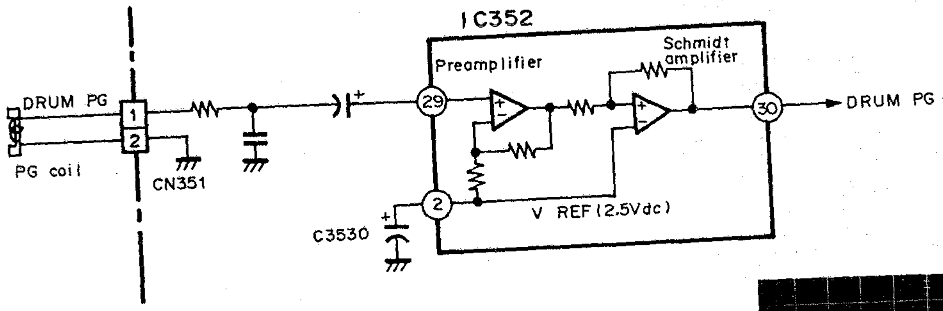


Fig. 4.

2-2. DRUM PG AMPLIFIER

The drum PG amplifier shapes the drum PG signal (40 msec cycle = 25 Hz) generated at the drum PG coil to the waveform of a rectangular wave.


IC352
Schmidt amplifier
Preamplifier
DRUM PG
1
2
PG coil
CN351
29
30
DRUM PG
2
V REF (2.5Vdc)
C3530

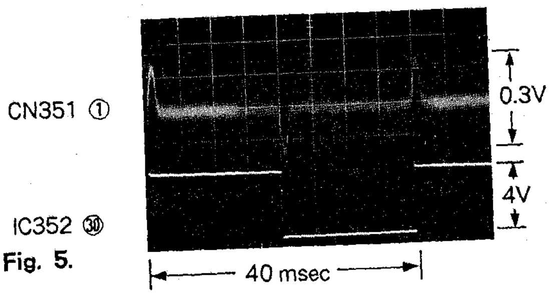


Fig. 5.

2-3. DRUM SPEED ERROR DETECTION

The cycle of the drum FG signal is measured.

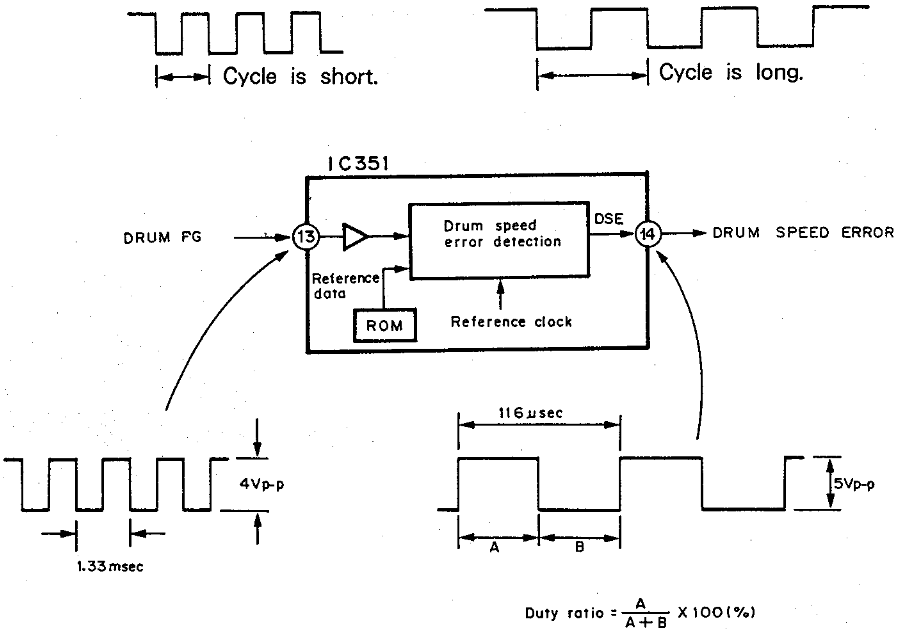

Cycle is short.
Cycle is long.
IC351
DRUM FG
13
Drum speed error detection
DSE
14
DRUM SPEED ERROR
Reference data
ROM
Reference clock
116μsec
4Vp-p
1.33msec
5Vp-p
A
B
Duty ratio = A/(A+B) X 100(%)

Fig. 6.

The drum speed error is output from Pin 18 by the 8.6 kHz PWM signal.
The PWM signal changes as given below depending upon the drum speed.

Drum speed	Drum FG cycle	PWM signal duty ratio
Fast	1.33 msec or less	50% or less
Correct	1.33 msec	50%
Slow	1.33 msec or more	50% or more

2-4. DRUM PHASE ERROR DETECTION

A SW25 signal is generated by a combination of the drum PG signal and the drum FG signal to phase compare with the REF25 generated by the reference counter for detection of a drum phase error.

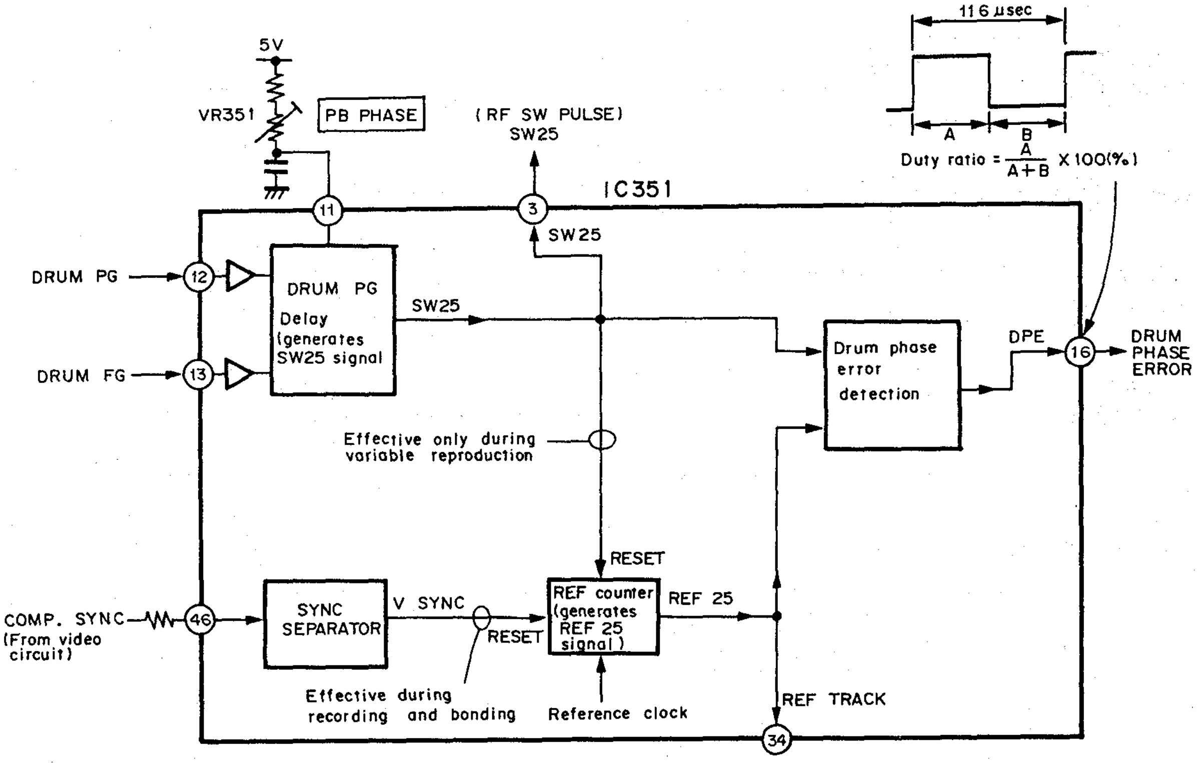
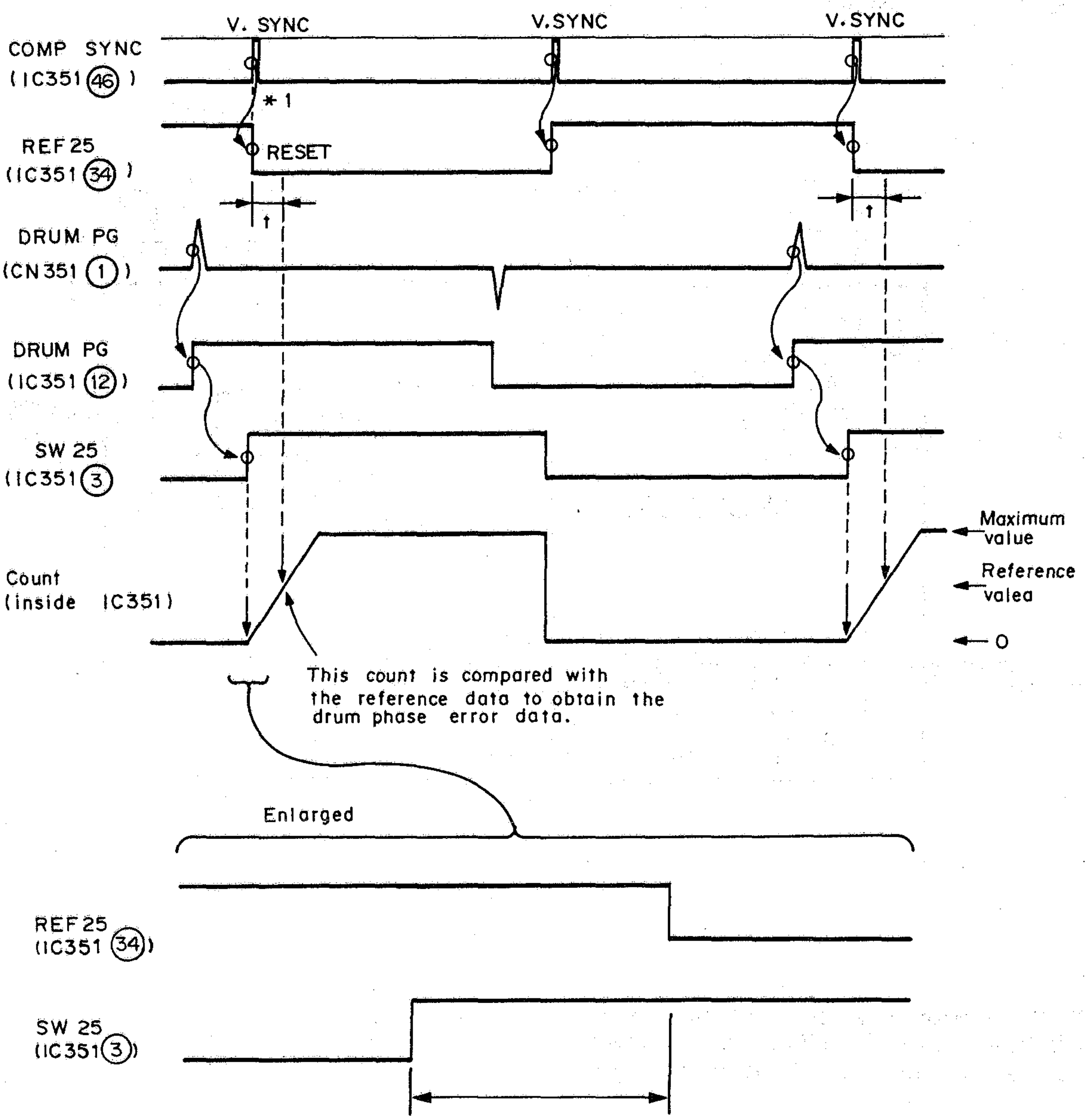

11 6 µsec
A
B
Duty ratio = $\frac{A}{A+B}$ X 100(%)
5V
VR351
PB PHASE
(RF SW PULSE)
SW25
IC351
11
3
SW25
DRUM PG
12
DRUM PG
Delay
(generates
SW25 signal
SW25
DRUM FG
13
Drum phase
error
detection
DPE
16
DRUM
PHASE
ERROR
Effective only during
variable reproduction
RESET
COMP. SYNC
(From video
circuit)
46
SYNC
SEPARATOR
V SYNC
RESET
REF counter
(generates
REF 25
signal)
REF 25
Effective during
recording and bonding
Reference clock
REF TRACK
34

Fig. 7.

The drum phase error is output from Pin 16 by the 8.6 kHz PUM signal. The PWM signal changes as given below, depending upon the drum phase error.

Phase of SW25 signal against reference phase	Drum phase error data	PWM signal duty ratio
Advanced phase	Lager than reference value	50% or more
Equivalent	Equal to reference value	50%
Delayed phase	Smaller than reference value	50% or less

*1 The REF25 signal is reset by the V SYNC only for REC (including the EE mode) mode and for connecting bonding recording.


V. SYNC
V.SYNC
V.SYNC
COMP SYNC
(IC351 ㊻)
*1
REF 25
(IC351 ㉞)
RESET
t
t
DRUM PG
(CN351 ①)
DRUM PG
(IC351 ⑫)
SW 25
(IC351 ③)
Count
(inside IC351)
Maximum value
Reference valea
0
This count is compared with the reference data to obtain the drum phase error data.
Enlarged
REF 25
(IC351 ㉞)
SW 25
(IC351 ③)

phase difference when drum phase is locked

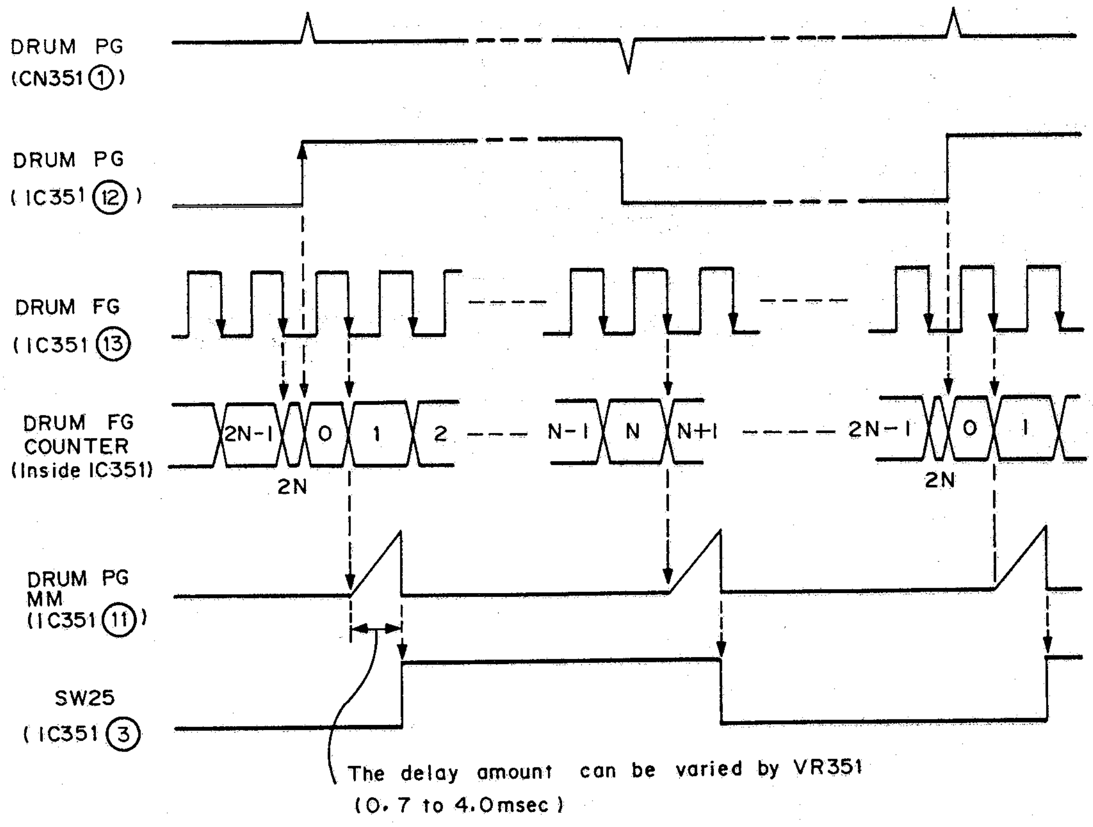
- PB---50 usec
- Variable speed reproduction--- 0 usec (fixed---phase servo is not applied)
- Others---Approx. 410 usec (6.5H)

SUPPLEMENTARY DESCRIPTION

(1) Generation of SW25 Signal

The SW25 generation circuit consists of a digital counter and analog MMV.

Digital counter :	Counts up at the falling edge (¯|_) of the drum FG signal (pulse) and is reset at the rising edge (_|¯) of the drum PG signal (pulse).
Analog MMV :	Switching position adjusting delay circuit Triggered when the count value of the digital counter changes from 0 to 1 or from N to N + 1. Time constant is determined by the CR connected to Pin 11. The MMV output (this is a SW25 signal, which corresponds to the RF SW pulse) changes ; from L to H level when the count value has changed from 0 to 1, and also from H to L level when it has changed from N to N + 1.


DRUM PG (CN351 ①)
DRUM PG (IC351 ⑫)
DRUM FG (IC351 ⑬
DRUM FG COUNTER (Inside IC351)
2N-1
0
1
2
N-1
N
N+1
2N-1
0
1
2N
2N
DRUM PG MM (IC351 ⑪)
SW25 (IC351 ③

The delay amount can be varied by VR351 (0. 7 to 4.0msec)

(2) Generation of REF25 Signal

The REF25 signal is generated by counting the reference clock by the 25 Hz pulse inverted at 20 msec cycle.

[During REC]

The reference counter is reset by the V sync signal separated from the input video signal, and the reference counter output (REF25 signal) is inverted at the same time.

The design is such that stable operation can be ensured even when the V sync signal is missing, or when noise is introduced.

When the V sync signal is not fed at all, the REF25 signal is also inverted at a cycle of 20 msec just as the maximum count value of the reference counter is set to the number of clocks at a cycle of 20 msec during the playback.

[During PB]

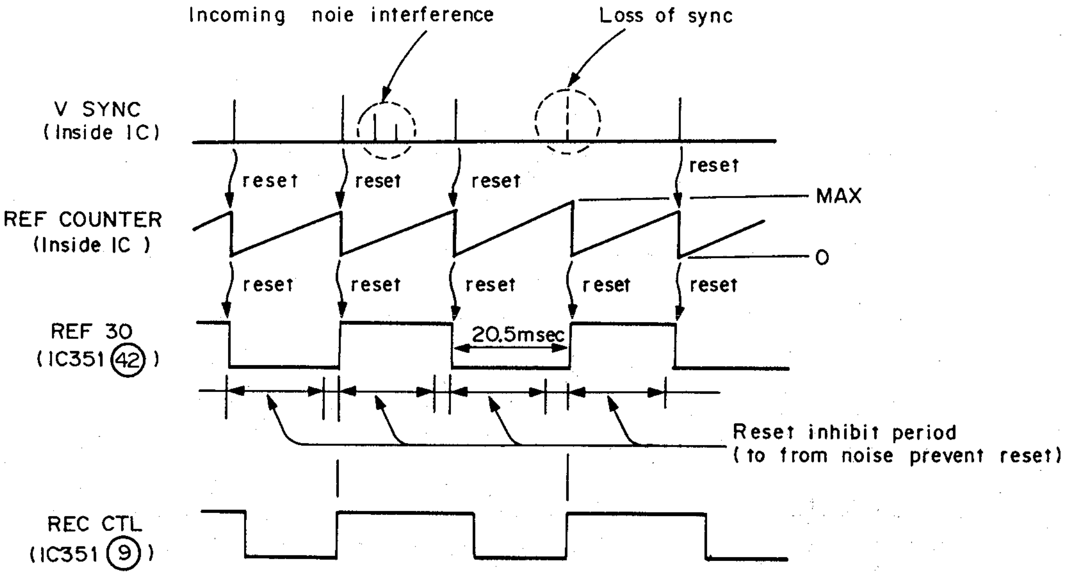
The reset input (V sync signal input) of the reference counter is inhibited. The reference counter counts clocks and is reset to 0 when the count value reaches the maximum value set for playback mode.

The REF25 signal is inverted at a cycle of 20 msec because the maximum value is set to the number of clocks at the 20 msec cycle.

[During the Variable Speed PB]

The reference counter is reset at the rising edge (⎍) and the falling edge (⏋⎽) of the SW25 signal.

Therefore, the SW25 signal and the REF25 signal coincides with each other in phase. (But the phase is reversed.)


Incoming noie interference
Loss of sync
V SYNC
(Inside IC)
reset
reset
reset
reset
REF COUNTER
(Inside IC)
MAX
0
reset
reset
reset
reset
reset
REF 30
(IC351 ㊷)
20.5msec
Reset inhibit period
(to from noise prevent reset)
REC CTL
(IC351 ⑨)

2-5. LPF AND DRUM SERVO ERROR MIX AMPLIFIER

1) LPF
The drum error signal is output by the PWM signal. This signal is therefore made a DC error signal by a low-pass filter (LPF).

2) Error Mix Amplifier
The drum speed error and drum phase error signals smoothed by the LPF are mixed with each other to generate a drum motor control signal (DRUM CTL).

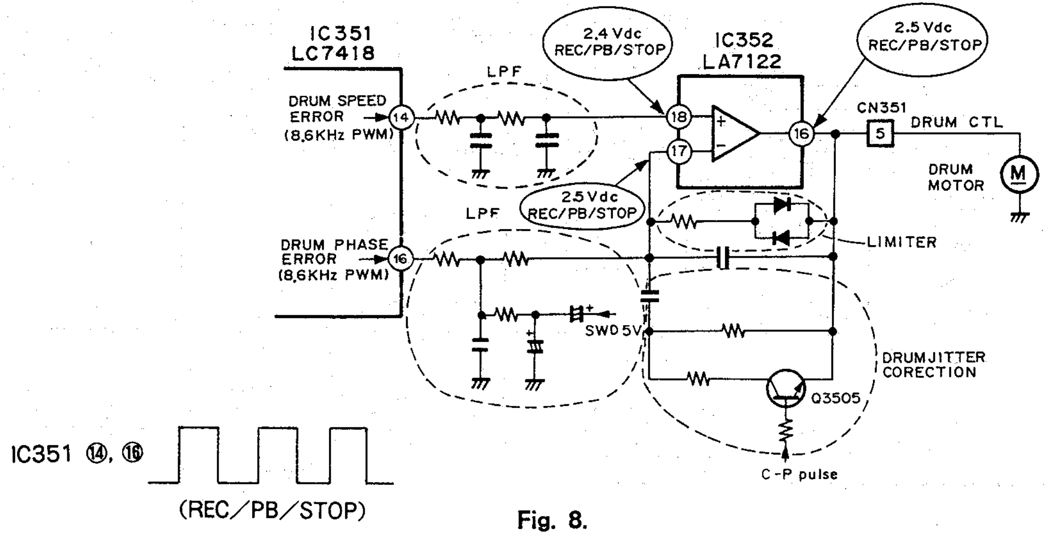

IC351
LC7418
DRUM SPEED ERROR
(8.6KHz PWM)
14
LPF
2.4 Vdc REC/PB/STOP
IC352
LA7122
18
17
16
2.5 Vdc REC/PB/STOP
CN351
5
DRUM CTL
DRUM MOTOR
M
2.5 Vdc REC/PB/STOP
LPF
DRUM PHASE ERROR
(8.6KHz PWM)
16
LIMITER
SWD 5V
DRUMJITTER CORECTION
Q3505
C-P pulse
IC351 ⑭, ⑯
(REC/PB/STOP)

Fig. 8.

2-6. DRUM f_H CORRECTION

If, during the variable playback mode (CUE, REVIEW, or PAUSE), the drum speed is set at the same speed as that in the normal playback mode, the relative speeds of the video head and the tape are changed. This in turn causes the horizontal sync signal of the monitor TV to go out of synchronization. To prevent this from occurring, the drum speed is varied during the variable playback mode to keep the frequency of the playback H sync signal unchanged.

The drum speed is changed by varying the reference data of the drum speed error detection circuit. (Refer to 2-3.)
Speed change in each mode is as follows.

	Speed Change (%)	
Mode	SP	LP
PAUSE (STILL)	− 0.5	− 0.24
CUE	+ 3.8	+ 1.4
REVIEW	− 4.8	− 1.92

− : Speed down.
+ : Speed up.

In the above mode, incidentally, the 8.6 kHz PWM signal of the drum phase error output (Pin 16 of IC351) is fixed at 50% of duty. (The drum phase servo does not function.)

3. CAPSTAN SERVO

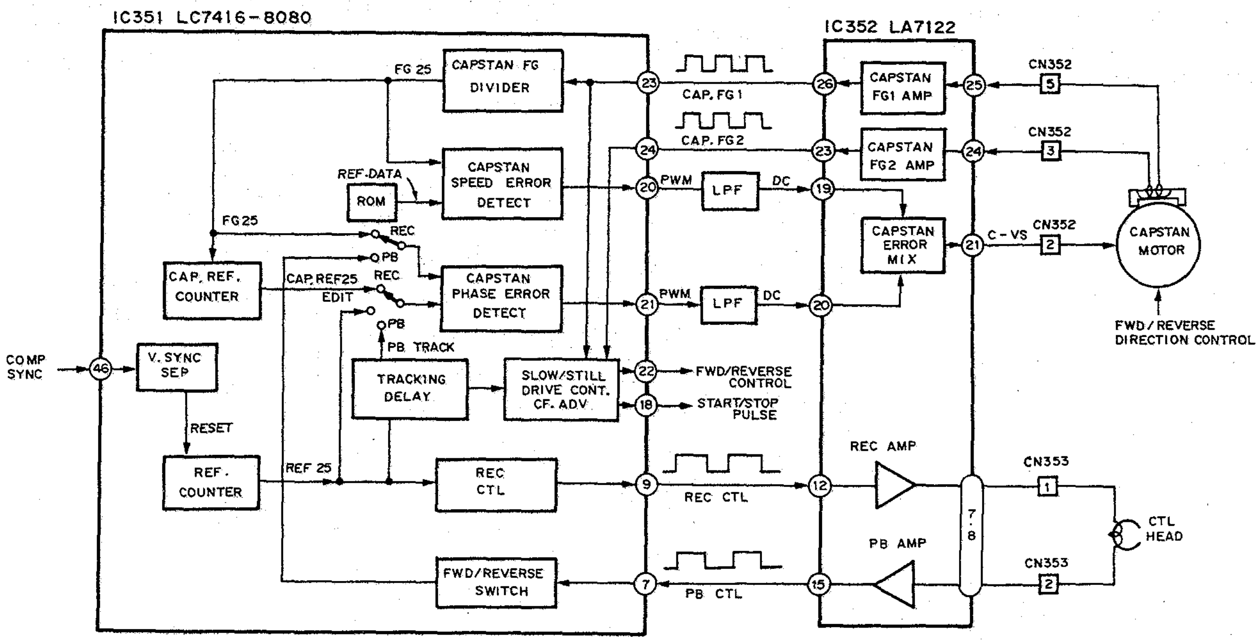

IC351 LC7416-8080
IC352 LA7122
FG 25
CAPSTAN FG DIVIDER
CAPSTAN SPEED ERROR DETECT
REF-DATA
ROM
FG25
REC
PB
CAP. REF. COUNTER
CAP.REF25
EDIT
CAPSTAN PHASE ERROR DETECT
PB TRACK
COMP SYNC
V. SYNC SEP
RESET
TRACKING DELAY
SLOW/STILL DRIVE CONT. CF. ADV
REF. COUNTER
REF 25
REC CTL
FWD/REVERSE SWITCH
CAP. FG1
CAP. FG2
PWM
LPF
DC
FWD/REVERSE CONTROL
START/STOP PULSE
REC CTL
PB CTL
CAPSTAN FG1 AMP
CAPSTAN FG2 AMP
CAPSTAN ERROR MIX
REC AMP
PB AMP
C-VS
CN352
CN353
CAPSTAN MOTOR
FWD / REVERSE DIRECTION CONTROL
CTL HEAD
46
23
24
20
21
22
18
9
7
26
25
19
12
15
7
8
5
3
2
1

Fig. 9.

[Capstan Speed Error]
A speed error is detected by measuring the cycle of the FG25 signal which is derived by frequency dividing the capstan FG signal fed to Pin 23 and output to Pin 20 by the PWM signal.

[Capstan Phase Error]
REC ········Compares the phase of the FG25 signal with that of CAP REF25 signal.
PB ··········Compares the phase of the PB CTL signal with that of the PB TRACK signal derived by delaying the REF25 signal.
EDIT ·······Compares the phase of the PB CTL signal with that of the REF25 signal.
The phase error is output to Pin 21 by the PWM signal.

3-1. CAPSTAN FG AMPLIFIER

The capstan FG amplifier waveform-shapes the CAP FG1 signal (SP mode: approx. 1513 Hz) generated by rotation of the capstan rotor to a rectangular wave.

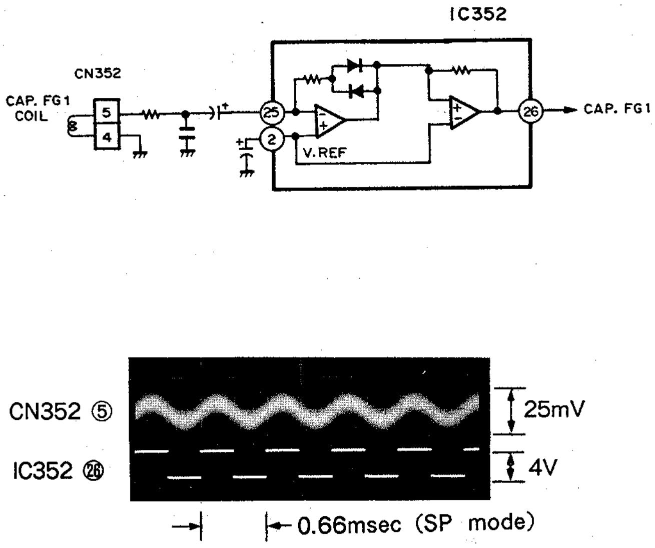

IC352
CN352
CAP. FG1 COIL
5
4
25
2
26
V.REF
CAP. FG1
CN352 ⑤
IC352 ㉖
25mV
4V
0.66msec (SP mode)

Fig. 10.

3-2. CAPSTAN SPEED ERROR DETECTION

The cycle of the frequency divided CAP FG signal is measured.

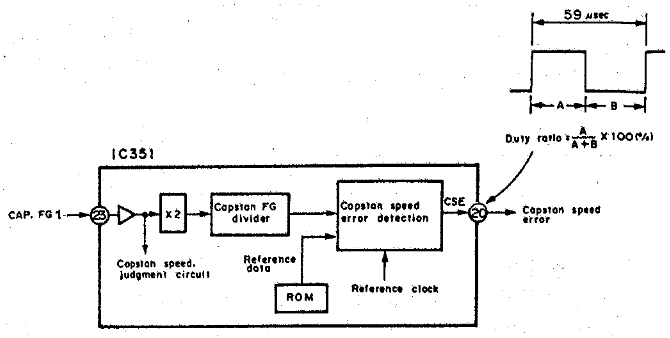

59 μsec
A
B
Duty ratio = A/(A+B) × 100(%)
IC351
CAP. FG1
23
x2
Capstan FG divider
Capstan speed error detection
CSE
20
Capstan speed error
Capstan speed judgment circuit
Reference data
ROM
Reference clock

Fig. 11.

The capstan speed error is output from Pin 22 by the PWM signal.

MODE / TAPE SPEED	REC/PB	PICTURE SEARCH
SP	17 kHz	17 kHz
LP	17 kHz	17 kHz

The duty ratio of the PWM signal varies as given below, depending upon the tape speed.

Capstan speed	CAPSTAN FG cycle	PWM signal duty ratio
Fast	t0 or less	50% or less
Correct	t0	50%
Slow	t0 or more	50% or more

The value of t0 for normal reproduction is as follows.

SP mode········0.66 msec (1513Hz)
LP mode········1.3 msec (756Hz)

3-3. CAPSTAN PHASE ERROR DETECTION

The method of detecting a phase error varies with each mode of REC, PB or EDIT.

Operation mode	Reference signal	Comparison signal
Playback (including variable speed playback)	The REF 25 signal (drum phase servo reference signal) delayed by the tracking delay circuit (PB TRACK signal)	PB CTL signal
Recording	C-REF 25 signal	FG 25 signal
Edit	REF 25 signal	PB CTL signal

[During REC]
The C-REF25 signal is phase compared with the FG25 signal derived by frequency dividing the capstan FG signal to generate a capstan phase error signal.

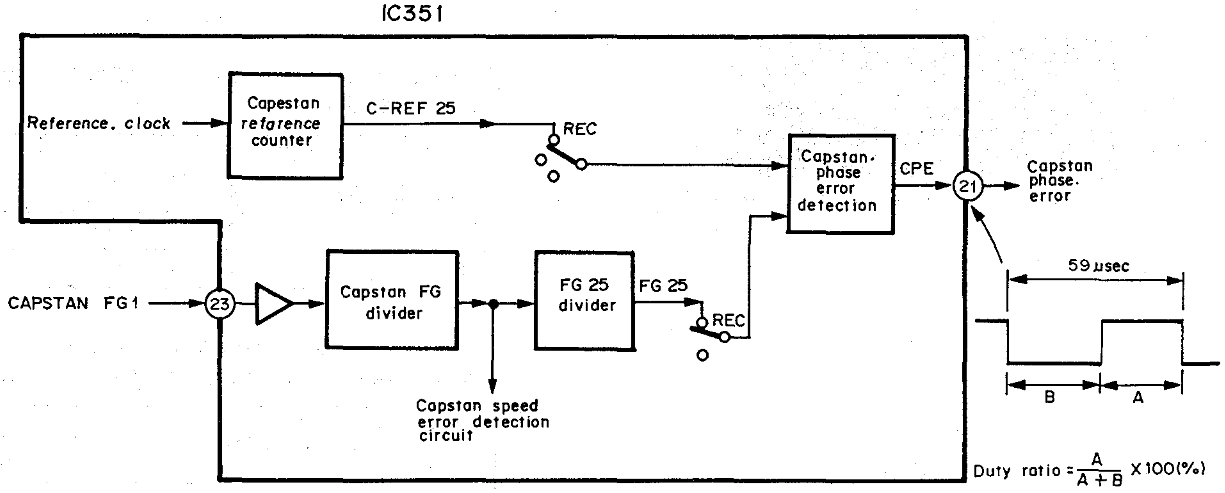

IC351
Reference. clock
Capestan refarence counter
C-REF 25
REC
Capstan. phase error detection
CPE
21
Capstan phase. error
CAPSTAN FG1
23
Capstan FG divider
FG 25 divider
FG 25
REC
Capstan speed error detection circuit
59 μsec
B
A
Duty ratio = A/(A+B) X100(%)

Fig. 12.

(1) CAPSTAN FG DIVIDER

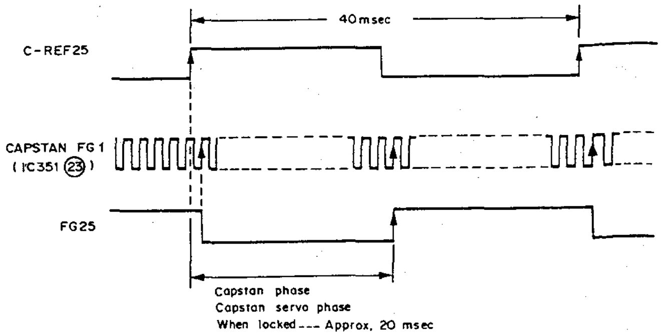
Mode	SP	LP
Castan FG frequencies (Hz)	1513	756
Diviation ratio	1/60	1/30
FG 25 frequencies (Hz)	25.223	

(2) Capstan Phase Error Output

The capstan phase error is output from Pin 21 by the 17 kHz PWM signal. The duty ratio of the PWM signal varies as given below, depending upon the phase difference.

Phase difference between C-REF signal and FG 25 signal	PWM signal duty ratio
Smaller than normal	50% or more
Normal	50%
Lager than normal	50% or less

(3) Timing Chart


40msec
C-REF25
CAPSTAN FG1 (IC351 ㉓)
FG25
Capstan phase
Capstan servo phase
When locked --- Approx. 20 msec

[During PB]

The PB track signal derived by delaying the REF25 signal is phase compared with the PB CTL signal to generate a capstan phase error signal.

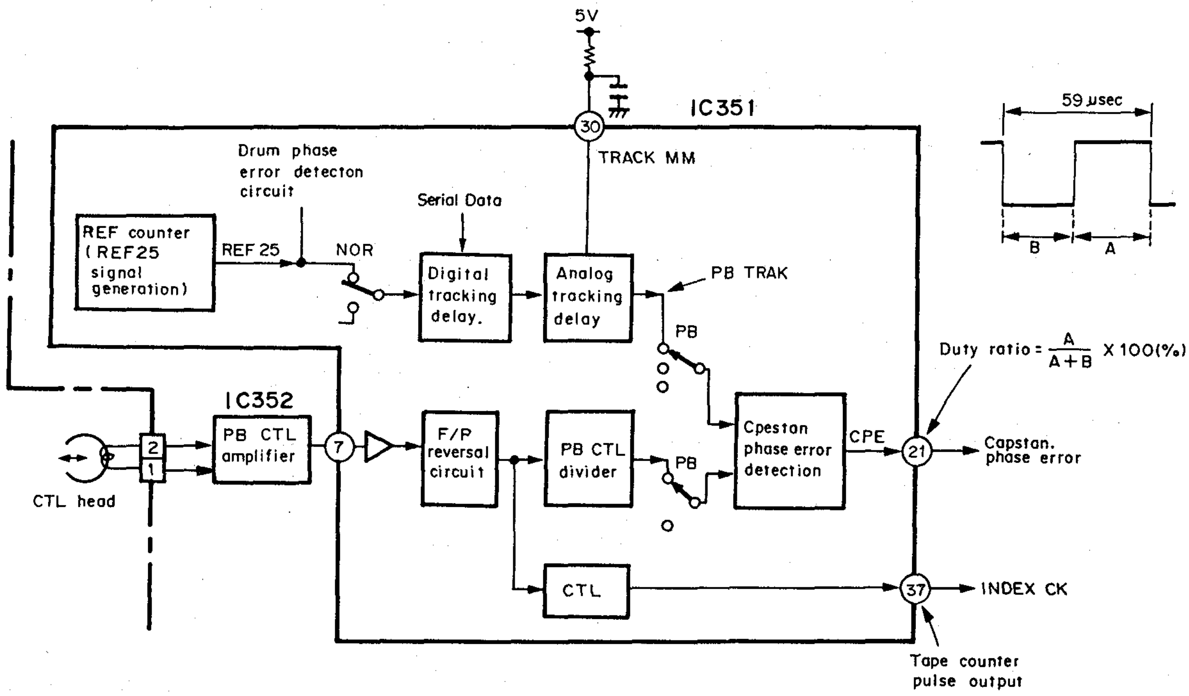

5V
IC351
30
TRACK MM
Drum phase error detecton circuit
Serial Data
REF counter (REF25 signal generation)
REF 25
NOR
Digital tracking delay.
Analog tracking delay
PB TRAK
PB
IC352
PB CTL amplifier
2
1
CTL head
7
F/P reversal circuit
PB CTL divider
PB
Cpestan phase error detection
CPE
21
Capstan. phase error
CTL
37
INDEX CK
Tape counter pulse output
59 μsec
B
A
Duty ratio = A/(A+B) X 100(%)

Fig. 13.

(1) Tracking Delay Circuit

The amount of delay can be varied by the user for tracking adjustment.

IC351 (LC7418) has a digital delay circuit and an analog delay circuit. In this unit, the amount of delay of the analog delay circuit is fixed to vary the amount of delay of the digital delay circuit only. The amount of digital delay can be varied by the serial data from the system control circuit.

Variable range : 0 ± 15 msec.
Tracking center : approx. 20 msec.

(2) FWD/REVERSE Inversion Circuit

The polarity of the PB CTL signal which becomes a comparator signal of the capstan phase servo varies when it is running forward and when it is running in the reverse direction. The polarity is reversed while the capstan servo is running in the reverse direction.

(In the forward operation, the rising edge (⨍) of the PB CTL signal is used for detection of a phase error.)

(3) PB CTL Frequency Division

The PB CTL signal is frequency divided as given below so as to fix the position of a noise bar on the CRT screen by operating the capstan phase servo even during the variable playback mode.

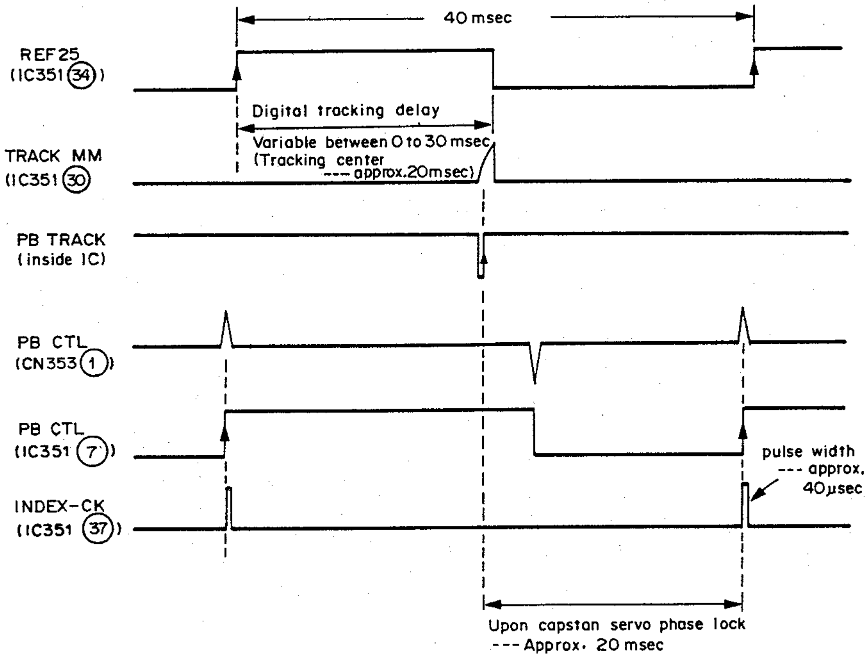
	PB	PICTURE SEARCH	
		SP	LP
Frequency dividing ratio	1	1/9	1/7

(4) Capstan Phase Error Output

The capstan phase error is output from Pin 21 by the 17 kHz PWM signal. The duty ratio of the PWM signal varies as given below, depending upon the phase difference.

Phase of PB CTL signal (rise) against reference phase PWM signal duty ratio	PWM signal duty ratio
Advanced phase	50 % or more .
Equivalent	50 %
Delayed phase	50 % or less

(5) Timing Chart



[During EDIT]

The REF25 signal is phase compared with the PB CTL signal to generate capstan phase error signal. At that time, the REF25 signal is in synchronization with the V sync signal sync separated from the input video signal just as in the case of "During REC".

Therefore , the drum motor rotates in synchronization with the input video signal to cause the tape to run over the track which has already been recorded as if the video head were tracing the record.

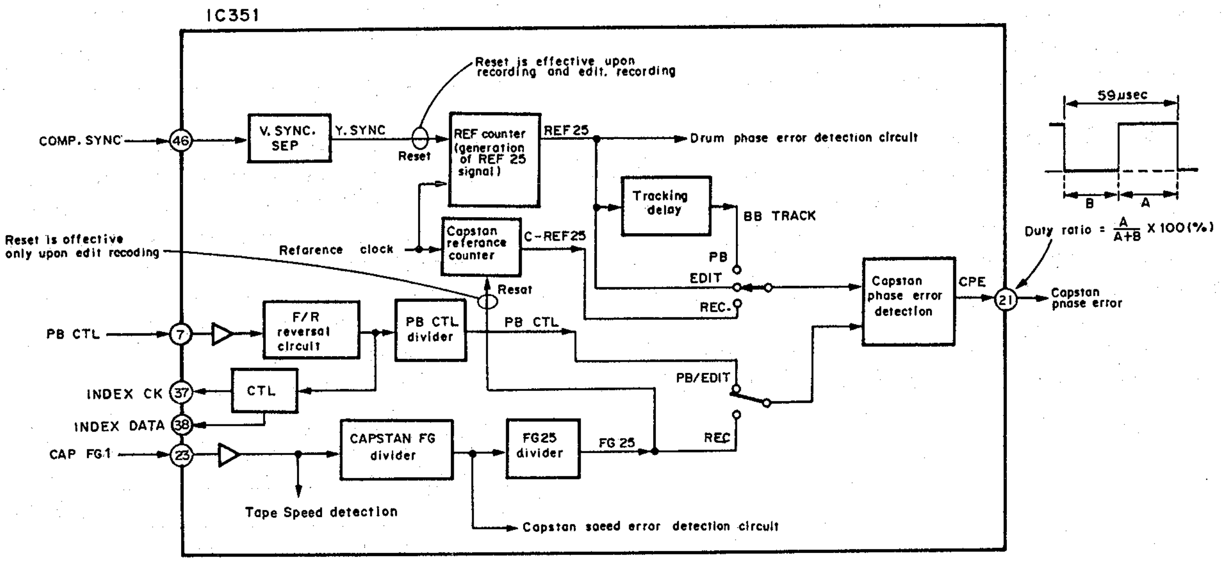

IC351
Reset is effective upon recording and edit. recording
COMP. SYNC
㊻
V. SYNC. SEP
Y. SYNC
Reset
REF counter (generation of REF 25 signal)
REF25
Drum phase error detection circuit
Tracking delay
BB TRACK
Reset is offective only upon edit recoding
Reference clock
Capstan referance counter
C-REF25
PB
EDIT
REC.
Resat
Capstan phase error detection
CPE
㉑
Capstan pnase error
PB CTL
⑦
F/R reversal circuit
PB CTL divider
PB CTL
PB/EDIT
INDEX CK ㊲
CTL
INDEX DATA ㊳
CAP FG1
㉓
CAPSTAN FG divider
FG25 divider
FG 25
REC
Tape Speed detection
Capstan saeed error detection circuit
59μsec
B
A
Duty ratio = A/(A+B) X 100(%)

Fig. 14.

(1) REF Counter (REF25 Signal Producing Circuit)

The REF25 signal is reset by the V sync signal separated from the input video signal, just as in the case of "During REC". Therefore, this signal is synchronized with the input video signal. The rotating phase of the drum is in synchronization with the input video signal for that reason.

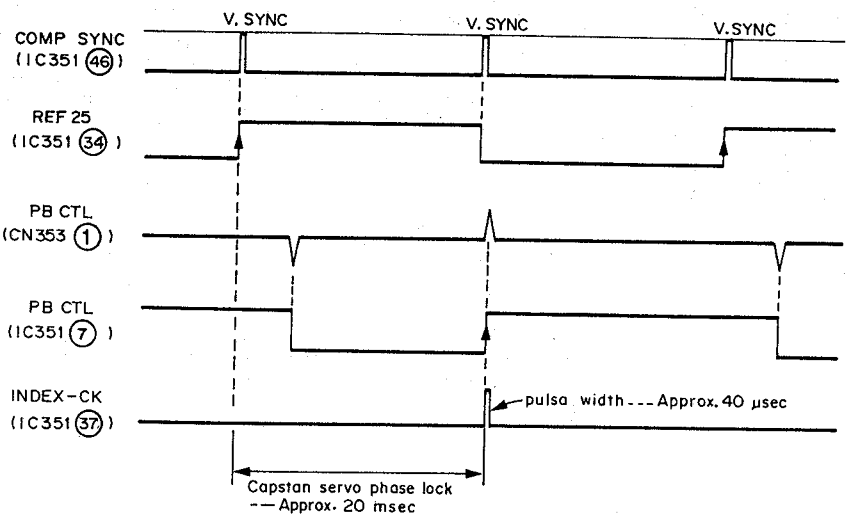
(2) F/R Inversion Circuit

The tape runs a little in the reverse direction when the mode is changed from REC to REC PAUSE. The PB CTL signal is inverted during this time.

(3) Capstan Phase Error Output

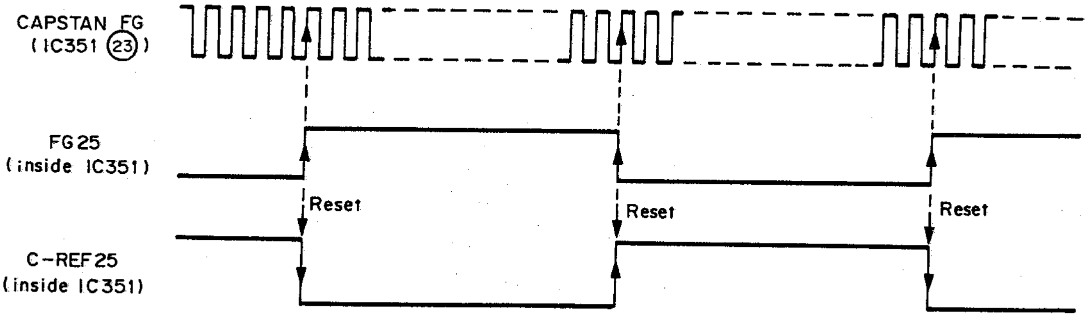
The capstan phase error is output from Pin 21 by the 17 kHz PWM signal. As a result, an 17 kHz PWM signal of 50% in duty ratio is output when the time difference between the rising edge (⌠) of the REF25 signal and the falling edge (⌐L) of the PB CTL signal is 20 msec.

(4) Timing Chart


V. SYNC
V. SYNC
V.SYNC
COMP SYNC (IC351 ㊻)
REF 25 (IC351 ㉞)
PB CTL (CN353 ①)
PB CTL (IC351 ⑦)
INDEX-CK (IC351 ㊲)
pulsa width---Approx.40 μsec
Capstan servo phase lock --Approx. 20 msec

(5) REC PAUSE→REC

To cause the phase lock of the capstan phase servo to take place earlier, the capstan reference counter is reset by the FG25 signal during a period of phase servo operation in the EDIT mode, to synchronize the C-REF25 signal (reference signal) with the FG25 signal (comparison signal).


CAPSTAN FG (IC351 ㉓)
FG25 (inside IC351)
Reset
Reset
Reset
C-REF25 (inside IC351)

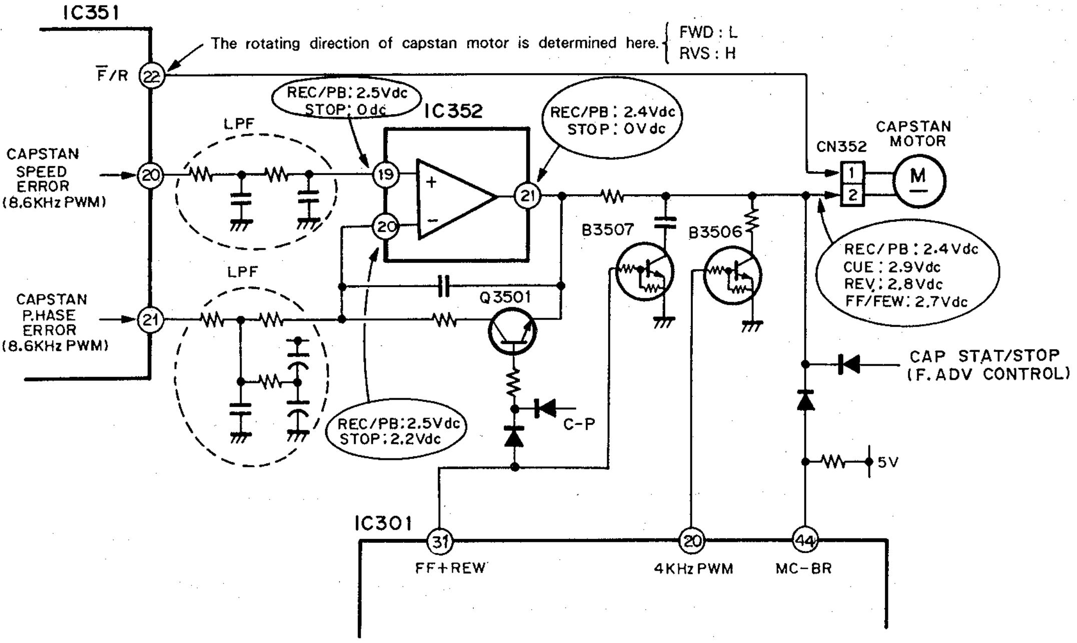
3-4. LPF AND CAPSTAN SERVO ERROR MIXING AMPLIFIER

(1) LPF

The capstan error signal is output by the PWM signal.
It is therefore made a DC error signal by the LPF.

(2) Error Mixing Amplifier

The capstan speed error signal smoothed by the LPF is mixed with the capstan error signal to generate a capstan motor control signal (CAP CTL).



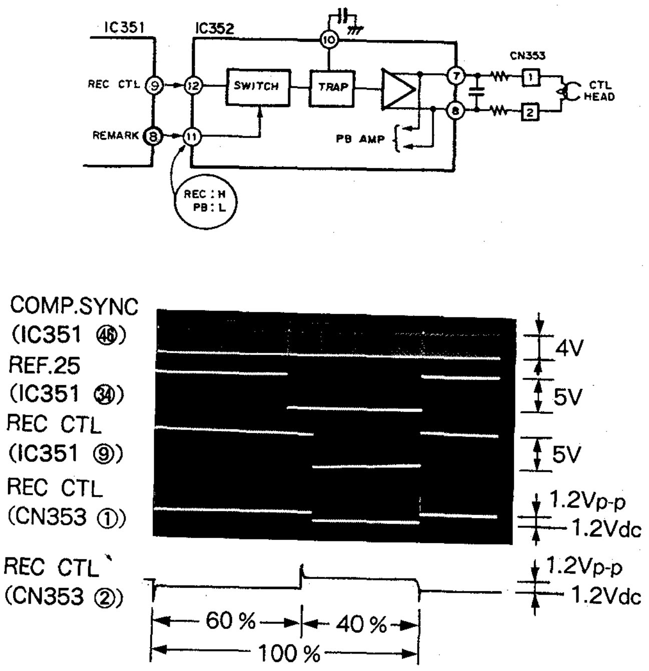
IC351
The rotating direction of capstan motor is determined here.
FWD : L
RVS : H
F̄/R
22
REC/PB: 2.5Vdc
STOP: 0dc
IC352
REC/PB: 2.4Vdc
STOP: 0Vdc
CAPSTAN MOTOR
CN352
M
1
2
LPF
CAPSTAN SPEED ERROR (8.6KHz PWM)
20
19
21
20
B3507
B3506
REC/PB: 2.4Vdc
CUE: 2.9Vdc
REV: 2.8Vdc
FF/FEW: 2.7Vdc
LPF
CAPSTAN PHASE ERROR (8.6KHz PWM)
21
Q3501
CAP STAT/STOP (F.ADV CONTROL)
REC/PB: 2.5Vdc
STOP: 2.2Vdc
C-P
5V
IC301
31
FF+REW
20
4KHz PWM
44
MC-BR

Fig. 15.

3-5. CTL SIGNAL

The CTL signal causes data to be recorded on the control track to generate a comparison signal of the capstan phase servo during the REC mode.

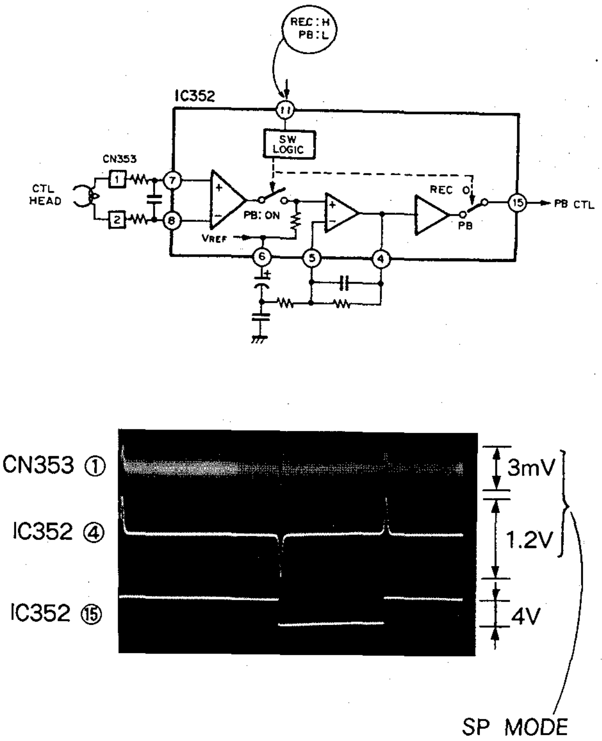
[During REC]
The REC CTL signal is generated from the REF25 signal which is the reference signal of the drum phase servo.



IC351
IC352
REC CTL ⑨
⑫
SWITCH
TRAP
⑩
⑦
⑧
CN353
1
2
CTL HEAD
REMARK ⑧
⑪
PB AMP
REC : H
PB : L
COMP.SYNC (IC351 ㊻)
REF.25 (IC351 ㉞)
REC CTL (IC351 ⑨)
REC CTL (CN353 ①)
REC CTL` (CN353 ②)
4V
5V
5V
1.2Vp-p
1.2Vdc
1.2Vp-p
1.2Vdc
60 %
40 %
100 %

Fig. 16.

[During PB]
The CTL signal played back by the CTL head is waveform shaped to the rectangular wave.



REC : H
PB : L
IC352
⑪
SW LOGIC
CN353
CTL HEAD
1
2
⑦
⑧
PB: ON
VREF
REC
PB
⑮
PB CTL
⑥
⑤
④
CN353 ①
IC352 ④
IC352 ⑮
3mV
1.2V
4V
SP MODE

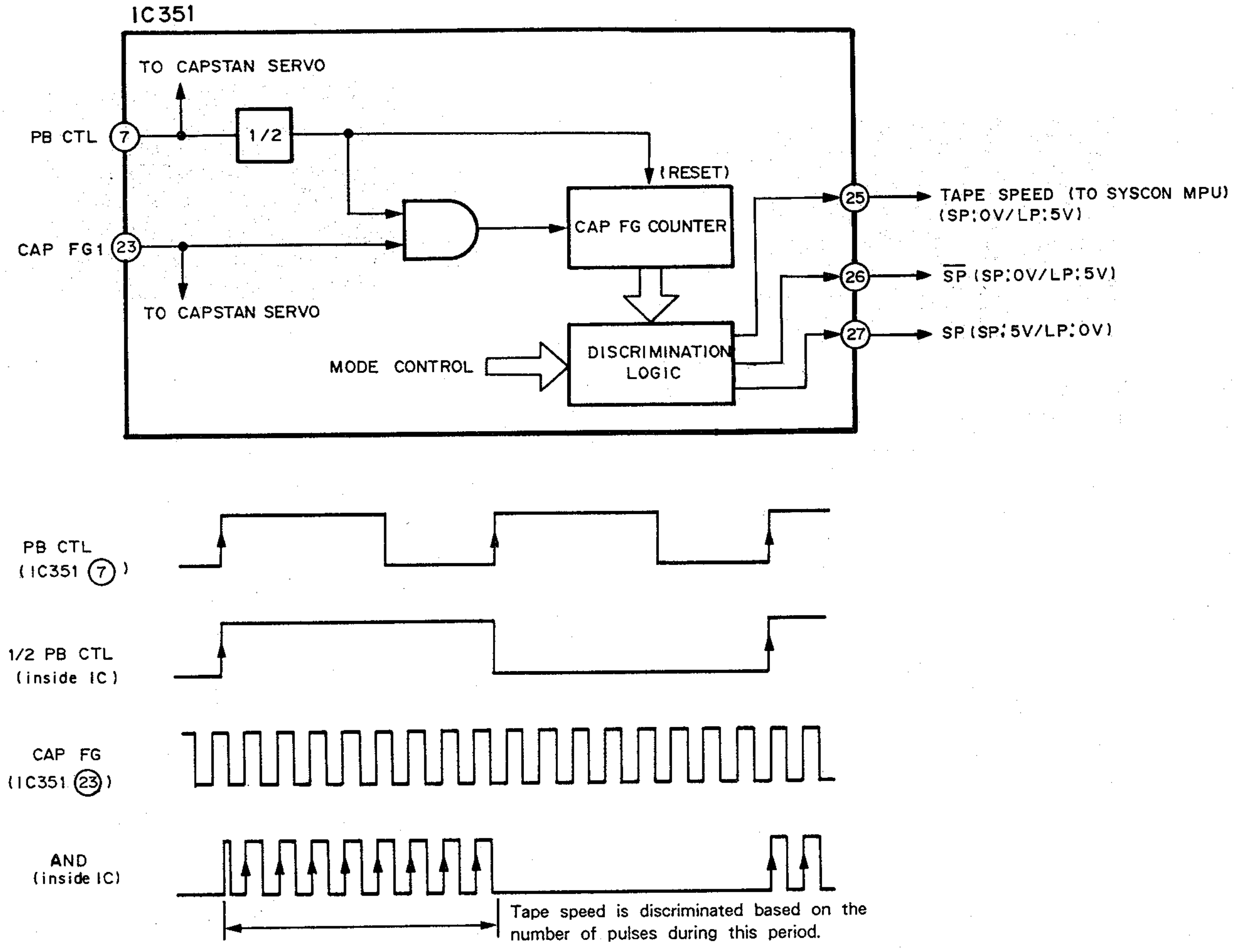
Fig. 17.

4. TAPE SPEED DISCRIMINATION CIRCUIT

[During REC]
This circuit discriminates the tape speed data sent from the system control circuit and outputs it from the SP/LP terminal in a binary code of either high or low level.

[During PB]
The tape speed is discriminated by the number of capstan FG signals (number of pulses) counted during one cycle of the PB CTL signal. The discrimination results immediately beforehand are held during a still (pause) period or when changing the mode.

The discrimination result is sent to the system control microprocessor (IC301) from Pin ㉕ once and output from the system control microprocessor as normal tape speed data (SV DATA). This data is fed back to the servo IC (IC351). This tape speed data from the system control microprocessor is use to control the servo system, similar to the recording mode.
The discrimination results are output from the SP/LP terminal in a binary code of either high or low level.


IC351
TO CAPSTAN SERVO
PB CTL ⑦
1/2
(RESET)
CAP FG COUNTER
CAP FG1 ㉓
TO CAPSTAN SERVO
MODE CONTROL
DISCRIMINATION LOGIC
㉕ TAPE SPEED (TO SYSCON MPU) (SP:0V/LP:5V)
㉖ $\overline{\text{SP}}$ (SP:0V/LP:5V)
㉗ SP (SP:5V/LP:0V)
PB CTL (IC351 ⑦)
1/2 PB CTL (inside IC)
CAP FG (IC351 ㉓)
AND (inside IC)

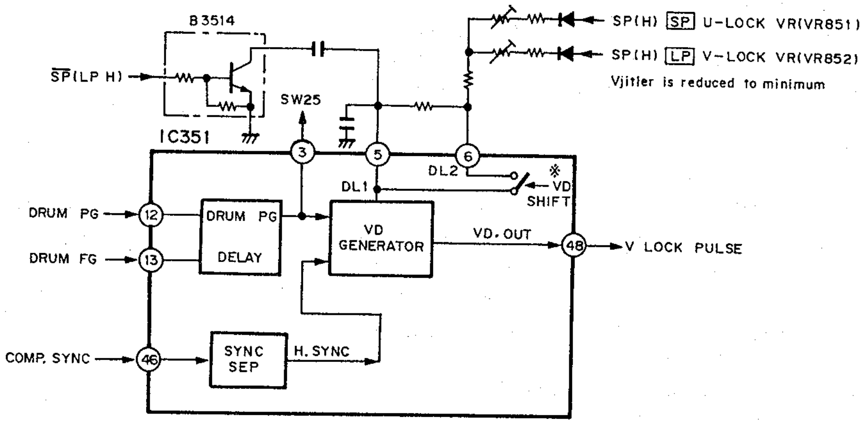
Tape speed is discriminated based on the number of pulses during this period.

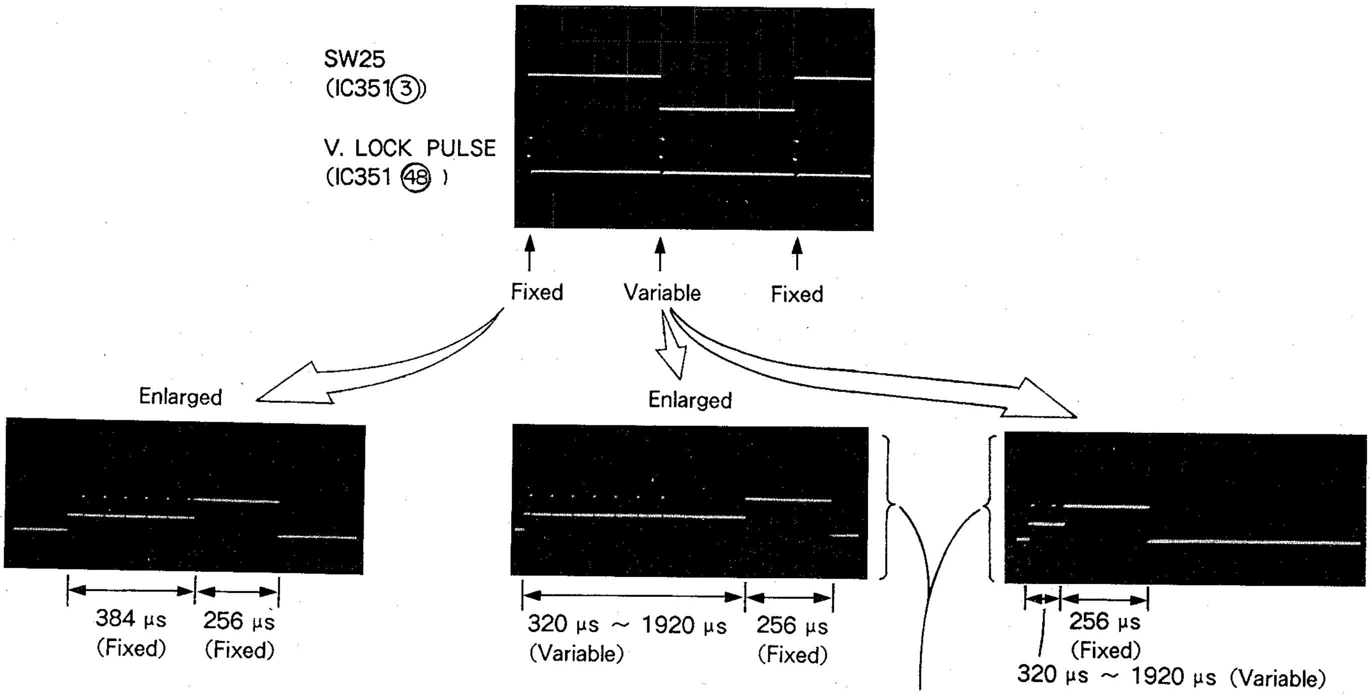
Fig. 18.

5. PSEUDO VD SIGNAL

A pseudo VD signal is added to the PB video signal to stabilize vertical synchronization during the special playback mode.
This pseudo VD signal is generated from the SW25 signal, and H sync signal component is also added. Also, since the H sync signal component is generated by sync separation from the PB video signal, the H sync signal component is not added when it cannot be sync separated from the PB video signal (for example, when there is much noise in the PB video signal, or when playing a none-recording type tape).

Output Level at Pin 48	Video signal
H	Clamped to sync chip level.
M	Clamped to pedestal level.
L	PB signal is directly output.


B3514
SP(LP H)
IC351
SW25
3
5
6
DL2
DL1
VD SHIFT
DRUM PG
DRUM FG
12
13
DRUM PG
DELAY
VD GENERATOR
VD. OUT
48
V LOCK PULSE
COMP. SYNC
46
SYNC SEP
H. SYNC
SP(H) SP U-LOCK VR(VR851)
SP(H) LP V-LOCK VR(VR852)
Vjitter is reduced to minimum



The period of H sync section is varied with VR851 (SP mode) or VR852 (LP mode).

Fig. 19.

6. STILL/SLOW DRIVE (CAPSTAN MOTOR STEP DRIVE) CONTROL CIRCUIT

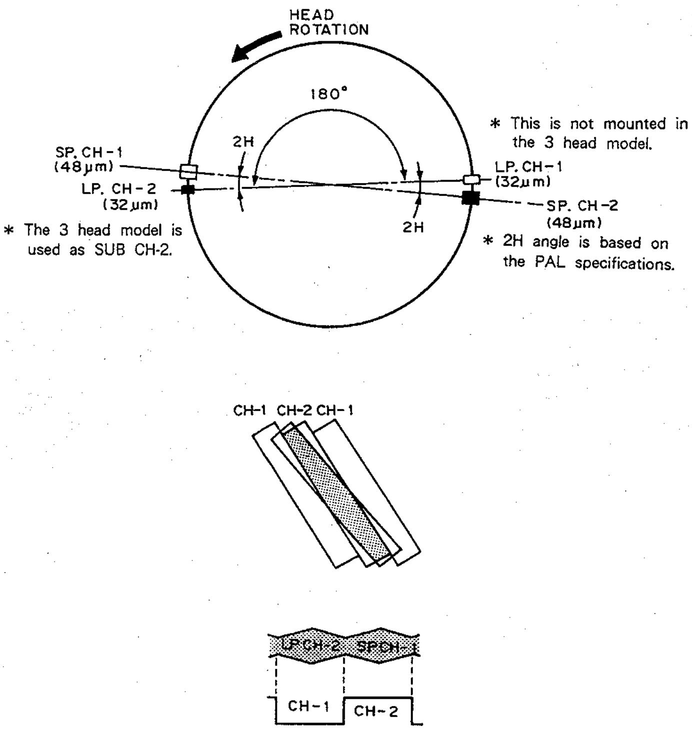
[General]

This circuit controls a tape stop to the noiseless position. noiseless frame advancing, and noiseless step drive in the still mode.

This control can be stopped in a still state or caused to make normal running (framing) for a period of two fields and then to the position where the recorded trace can be head-traced at the highest play level, based on the F. ADV pulse sent from the system control microprocessor in the form of serial data. The slow ratio is determined by the F. ADV pulse spacing so that 1/5 to 1/25 (PAL) can be set by using remote control [+] [−] buttons. In other words, the slow ratio makes the still period variable.

(1) In case of double azimuth 4 head (3 head) model, the field still playback can be done by using the identical head mounted at a diagonal position (180°) in the still mode. While the tape is running over two fields, normally used head is switched over. Incidentally, a 3 head model is for SP speed only. This operation is done in the same manner as in the SP mode of the 4 head model.

4 head configuration
Frame still playback



* The 3 head model is used as SUB CH-2.

* This is not mounted in the 3 head model.

* 2H angle is based on the PAL specifications.

Fig. 20.

(2) In case of 2 head model, the still trace of CH-1/CH-2 is caused to remain still at a position where the noise of both is not generated to play the frame still.

2 head configuration
Frame still playback

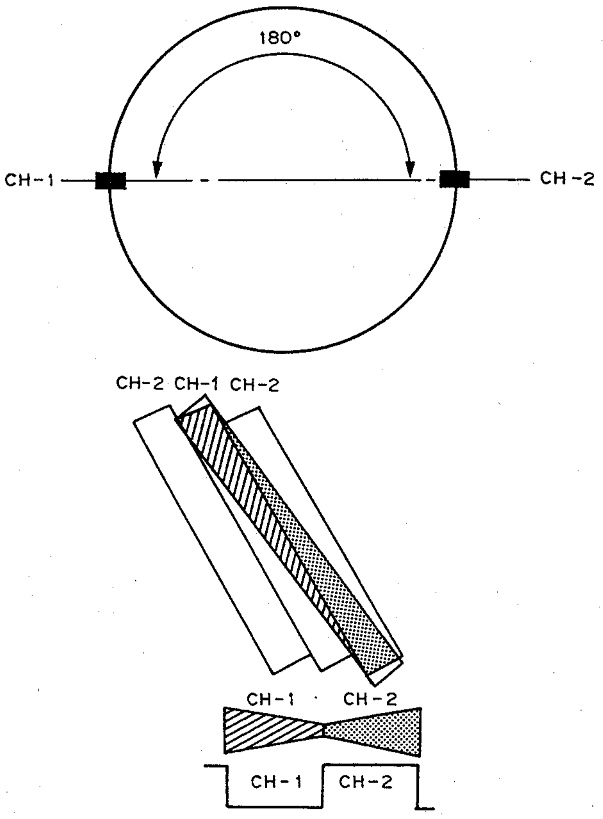


Fig. 21.

[Circuit Operation] ··· Fig. 23, Fig. 24

The F. ADV command data is fed to Pin ㊵ of IC351 from the system controller (IC301) in the form of serial data (SV S. DATA). Next, an internal F. ADV pulse, synchronized with the falling edge of the RF SW pulse, is generated in IC351.

To start the capstan motor from the still state, the data is delayed to the extent of start timing(T1) from the rising edge of the F. ADV pulse to generate a start pulse of (T2) width, and it is output from Pin ⑱ of IC351. As a result, the start pulse is supplied to the capstan motor from Pin ⑮ of CN301 as starting voltage of the capstan motor.

The start timing (T1) and pulsewidth (T2) are generated by the digital monostable multivibrator in IC so that it becomes the following time constant.

		T1	T2
4 Head Model	SP	10 msec	10 msec
	LP	12 msec	8 msec
2 Head Model	PAL SP	2 msec	10 msec

* 3 head model : SP mode only.

* 2 head model applies only to SP mode.

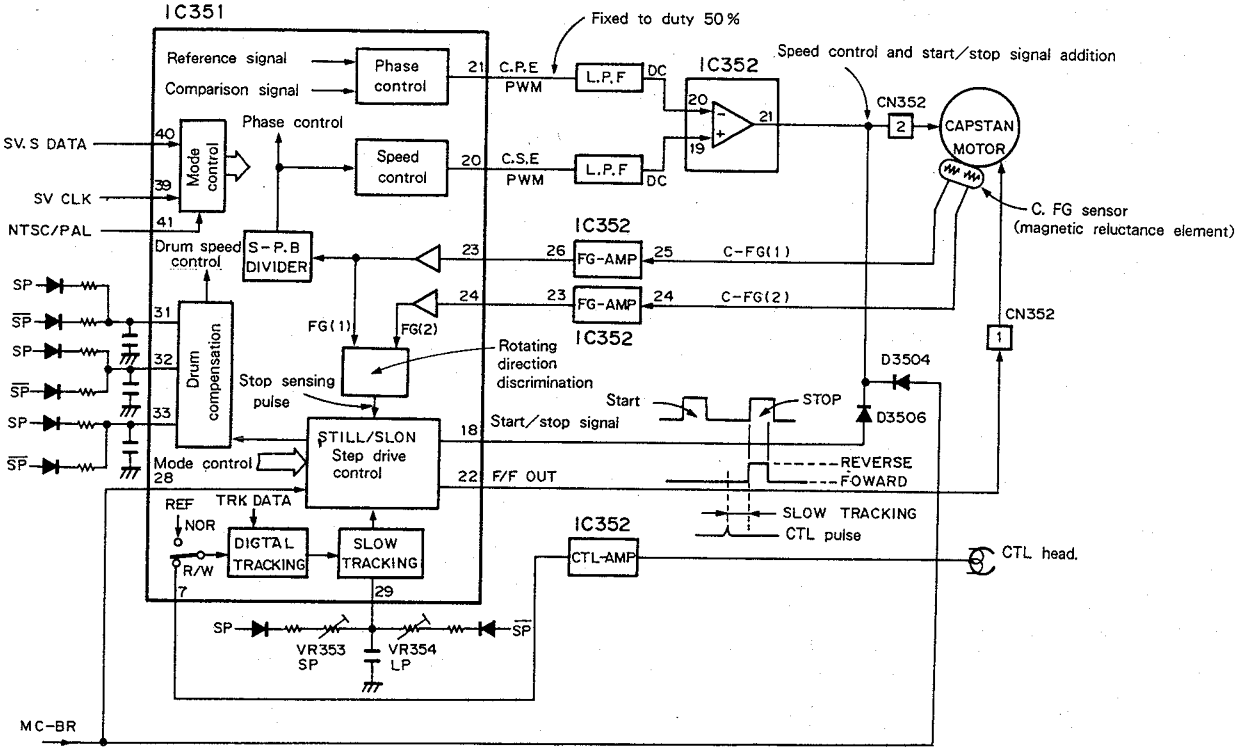
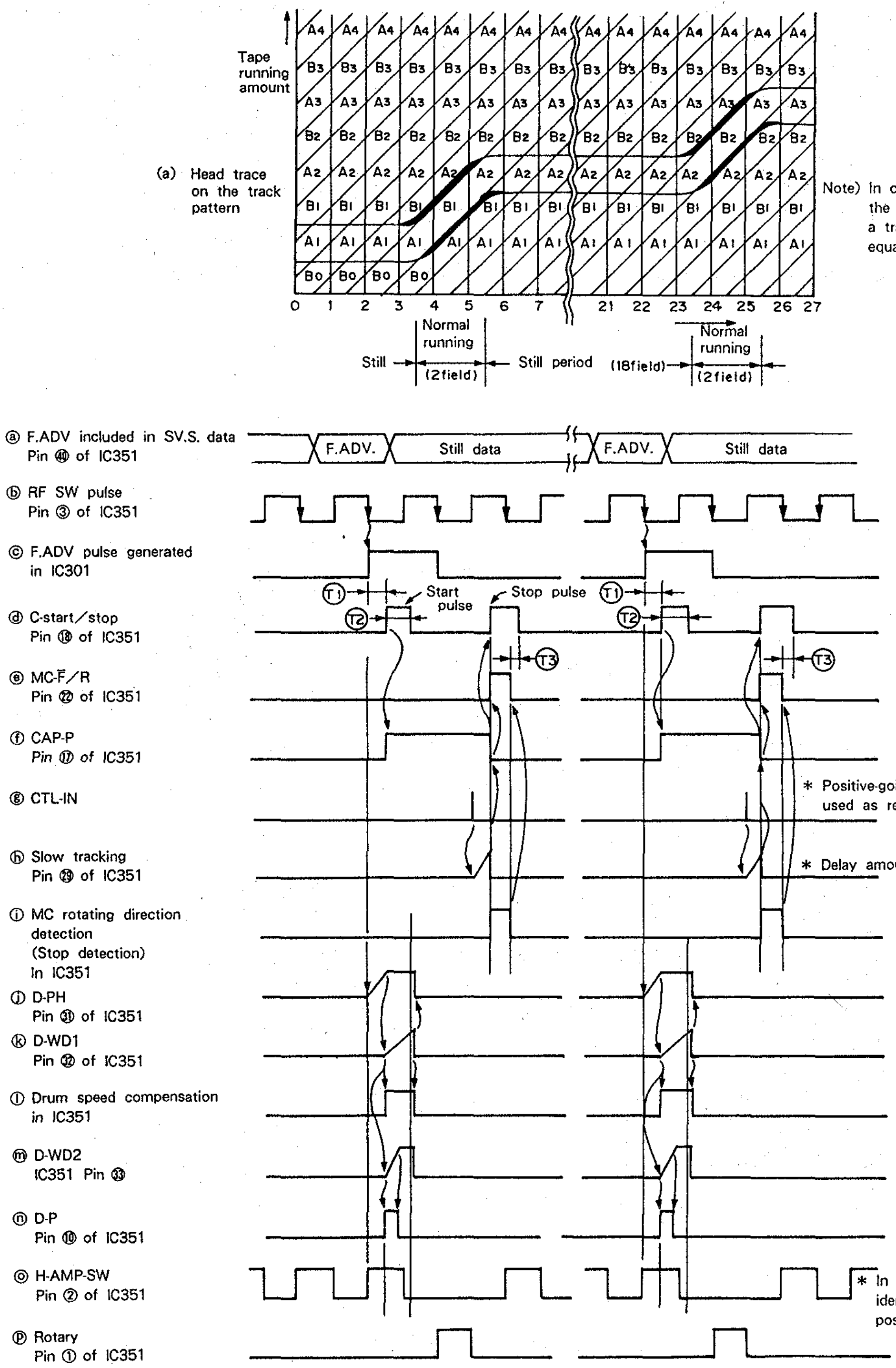

IC351
Reference signal
Comparison signal
Phase control
Phase control
Speed control
Mode control
SV. S DATA
SV CLK
NTSC/PAL
40
39
41
Drum speed control
S-P.B DIVIDER
Drum compensation
31
32
33
SP
SP
SP
SP
SP
SP
FG(1)
FG(2)
Stop sensing pulse
STILL/SLON Step drive control
Mode control
28
REF
TRK DATA
NOR
R/W
DIGITAL TRACKING
SLOW TRACKING
7
29
VR353 SP
VR354 LP
MC-BR
21
20
23
24
18
22
C.P.E PWM
C.S.E PWM
Fixed to duty 50%
L.P.F
L.P.F
DC
DC
IC352
20
19
21
Speed control and start/stop signal addition
CN352
2
CAPSTAN MOTOR
C. FG sensor (magnetic reluctance element)
IC352
26
FG-AMP
25
C-FG(1)
23
FG-AMP
24
C-FG(2)
IC352
Rotating direction discrimination
Start/stop signal
Start
STOP
CN352
1
D3504
D3506
F/F OUT
REVERSE
FOWARD
SLOW TRACKING
CTL pulse
IC352
CTL-AMP
CTL head.

Fig. 23. Slow control circuit block

Head trace in 1/10 slow playback mode and the timing of control signal


Tape running amount
(a) Head trace on the track pattern
A4
B3
A3
B2
A2
B1
A1
B0
0 1 2 3 4 5 6 7 21 22 23 24 25 26 27
Still
Normal running (2field)
Still period (18field)
Normal running (2field)
ⓐ F.ADV included in SV.S. data Pin ㊵ of IC351
ⓑ RF SW pulse Pin ③ of IC351
ⓒ F.ADV pulse generated in IC301
ⓓ C-start/stop Pin ⑱ of IC351
ⓔ MC-F̄/R Pin ㉒ of IC351
ⓕ CAP-P Pin ⑰ of IC351
ⓖ CTL-IN
ⓗ Slow tracking Pin ㉙ of IC351
ⓘ MC rotating direction detection (Stop detection) In IC351
ⓙ D-PH Pin ㉛ of IC351
ⓚ D-WD1 Pin ㉜ of IC351
ⓛ Drum speed compensation in IC351
ⓜ D-WD2 IC351 Pin ㉝
ⓝ D-P Pin ⑩ of IC351
ⓞ H-AMP-SW Pin ② of IC351
ⓟ Rotary Pin ① of IC351
F.ADV.
Still data
T1
T2
T3
Start pulse
Stop pulse

Note) In case of two heads type, the still position will make a trace that A and B is equally played back.

* Positive-going edge of the CTL pulse is used as reference timing.

* Delay amount including the digital tracking

* In high level, switch over to the identical azimuth head at a diagonal position (180°).

* Field select signal of the chroma circuit

Note) In two head model, ⓞ H-AMP-SW and ⓟ rotary signals are not used.

Note) In the LP (EP) mode, ⓞ H-AMP-SW and ⓟ rotary signals become opposite phase.

Fig. 24.

After starting quickly with a start pulse to reach close to the normal playback speed, the normal playback speed is held by applying the speed control at a fixed speed.(Speed control is applied because FG is generated by rotation. At that time, the phase control does not work. Duty remains at 50%.)
The CTL pulse can be detected by the fact that the tape runs at the normal playback speed. With this CTL pulse (used only the rising edge) as a reference pulse, the digital tracking delay circuit operates. The tracking circuit consists of the digital tracking section which can be varied either by auto tracking or by the user, and the analog monostable multivibrator section which latter can cover deviations. The analog monostable multivibrator is used to set the amount of delay with use of VR353 (SP) /VR354 (LP) so as to compensate the reference value in the SP/LP modes.
With this tracking delay amount, the still position in which no noise can be generated is set. A stop pulse is generated based on this tracking delay amount, and this pulse is supplied to the capstan motor from Pin ⑱ (C-start/stop) of IC351. At the same time, MC-F̄/R (MC rotating direction indicating signal) is output from Pin ㉒ of IC351 to decelerate the capstan motor rapidly. Stop detection is performed by comparing the 90° phase difference of C-FG1 and C-FG2 signals. This principle is shown in Fig. 26.

When the motor's direction of rotation (the position reversed from the stop position) is detected. Mc-F/R is forced low. The falling edge of a stop pulse takes place after compensating the still position by forward rotation of the motor that failed to be reversed. This time is (T3) . The step slow playback is executed by repetition of a series of above operations.

[Head Drum Rotation Compensation During Still/Slow Period] ···Fig. 24, Fig. 23.
In slow playback, the still and play (2 fields) to be alternately made.
The number of fH played by the head varies with the still and the playback. A video image appears as a side sway (jitter) on the TV screen. To compensate it, the rotation speed of the head is varied during the still and during tape running. The drum pulse shown in Fig. 24 (waveforms ⓙ to ⓝ) is generated by the drum compensation circuit (in IC351), and ROM data on the drum speed control is switched at the same time.
Timing setting of the drum pulse is carried out by the time constant CR of Pins ㉛, ㉜, and ㉝. Incidentally, in the 4 head model, SP/LP time constants are switched to derive an optimum video image in both modes.

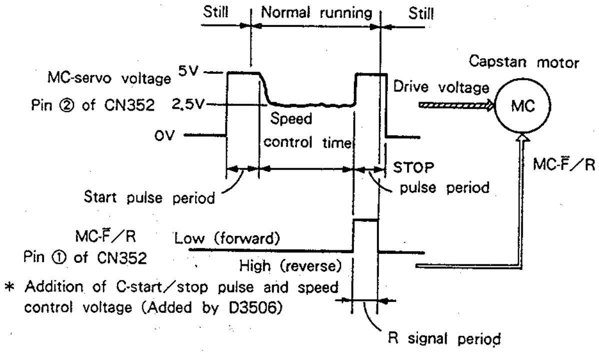

Still
Normal running
Still
Capstan motor
MC-servo voltage
Pin ② of CN352
5V
2.5V
0V
Speed
control time
Drive voltage
MC
MC-F̄/R
STOP
pulse period
Start pulse period
MC-F̄/R
Pin ① of CN352
Low (forward)
High (reverse)
* Addition of C-start/stop pulse and speed control voltage (Added by D3506)
R signal period

Fig. 25. Changes in capstan motor drive voltage from normal running to still

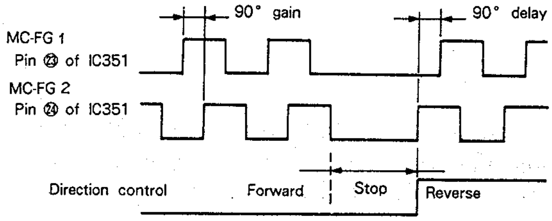

90° gain
90° delay
MC-FG 1
Pin ㉓ of IC351
MC-FG 2
Pin ㉔ of IC351
Direction control
Forward
Stop
Reverse

Fig. 26. Principle of capstan motor rotation direction discrimination

4. VIDEO CIRCUIT

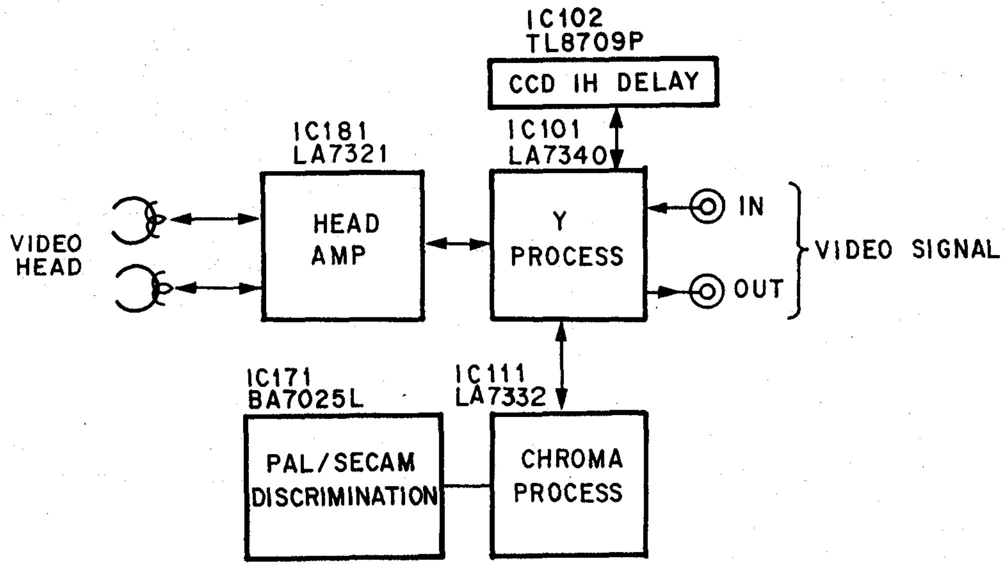

IC102
TL8709P
CCD IH DELAY
IC181
LA7321
IC101
LA7340
VIDEO
HEAD
HEAD
AMP
Y
PROCESS
IN
OUT
VIDEO SIGNAL
IC171
BA7025L
IC111
LA7332
PAL/SECAM
DISCRIMINATION
CHROMA
PROCESS

Fig. 1

The video circuit of this unit is mainly composed of three ICs. These are used for both recording and playback as selected by an internal switch.

CP-1 Board	IC101 (LA7340)	Y-PROCESS : AGC, EMPHASIS, FREQUENCY MODULATION (FM)
	IC102 (TL8709P)	1H CCD DELAY FOR Y-SIGNAL NC
	IC111 (LA7332)	CHROMA PROCESS : ACC, FREQUENCY CONVERSION
VP-1 Board	IC181 (LA7321)	HEAD AMP (3/4 HEAD)
VD-1 Board	IC171 (BA7025L)	PAL SECAM DISCRIMINATION(With model equiped MESECAM recording function only.)
CP-1 Board	IC161 (LA7221 or BA7021)	VIDEO INPUT SELECT (Some models are on the TB-1 Board)

1. LUMINANCE (Y) SIGNAL RECORDING SYSTEM

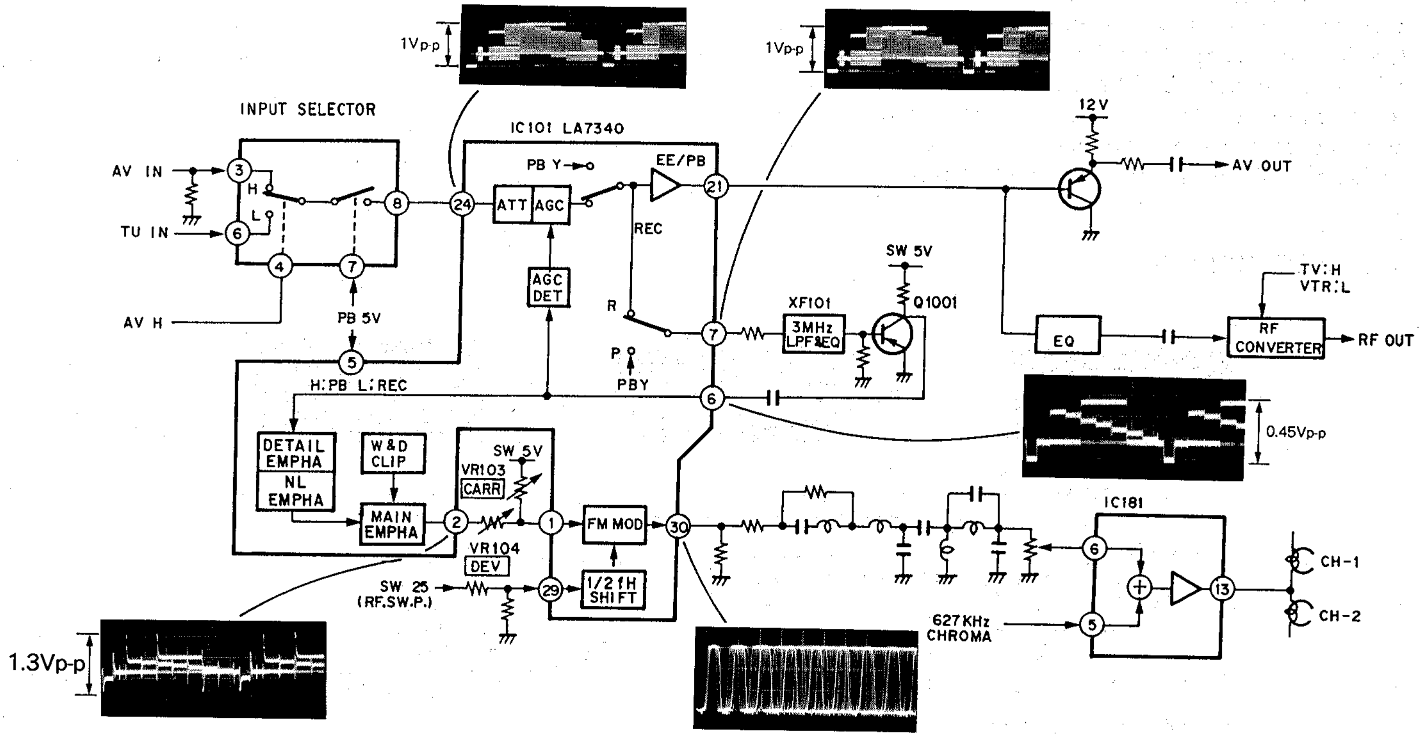

1Vp-p
1Vp-p
INPUT SELECTOR
IC101 LA7340
AV IN
TU IN
AV H
H
L
PB 5V
H:PB L:REC
PB Y
EE/PB
ATT
AGC
AGC DET
REC
R
P
PBY
12V
AV OUT
SW 5V
XF101
3MHz LPF&EQ
Q1001
TV:H
VTR:L
EQ
RF CONVERTER
RF OUT
0.45Vp-p
DETAIL EMPHA
NL EMPHA
W&D CLIP
MAIN EMPHA
SW 5V
VR103
CARR
VR104
DEV
FM MOD
1/2fH SHIFT
SW 25
(RF.SW.P.)
IC181
627KHz CHROMA
CH-1
CH-2
1.3Vp-p

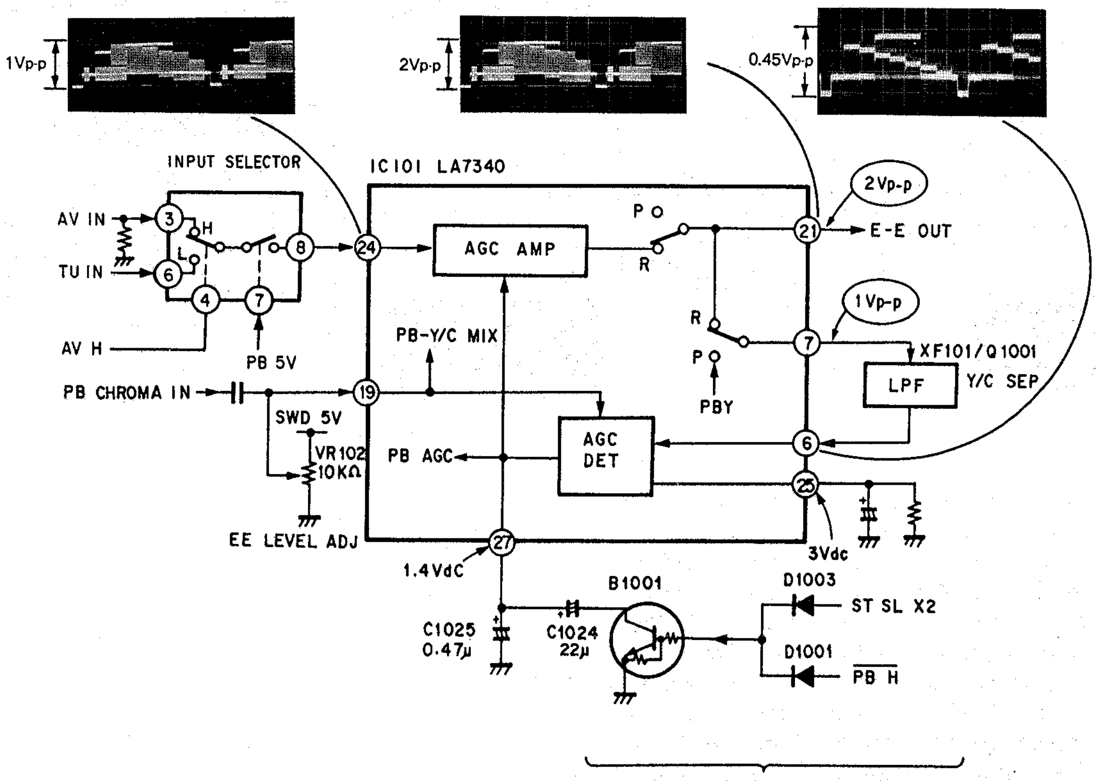
Fig. 2

The tuner (TV) or line signal is input to Pin ㉔ of IC101, its level is adjusted at the AGC circuit, then it is output to Pins ㉑ (E-E system) and ⑦ (recording system). The Y signal is extracted from the recording signal by a LPF and input to Pin ⑥. Then it passes through the detail enhancer, main emphasis and W/D clip circuits and is output to Pin ②. After this, the signal undergoes carrier frequency and deviation adjustment, then it is input to Pin ① and frequency-modulated. In the LP mode, 1/2fH shift is applied to this signal. The frequency-modulated Y signal passes through the equalizer circuit and is sent to the head amplifier IC. The Y-FM signal input to Pin ⑥ of. IC181 is mixed with the 627 kHz [(40 + 1/8) fH] chroma signal converted to low frequency internally, and then the resulting signal is sent to the video head through Pin ⑬.

1-1. INPUT SELECTION

Switching between the video signal from the tuner and the external video input signal from EURO terminal or from the RCA VIDEO IN is performed by input selector IC. The selected input signal (AV H) is input to Pin ④. A mute terminal (Pin ⑦) is provided to prevent input leaks. It mutes the output (selected) signal in the playback mode.

1-2. AGC CIRCUIT


1Vp-p
2Vp-p
0.45Vp-p
INPUT SELECTOR
IC101 LA7340
AV IN
TU IN
H
L
3
6
8
4
7
AV H
PB 5V
PB CHROMA IN
SWD 5V
VR102
10KΩ
EE LEVEL ADJ
24
19
27
AGC AMP
PB-Y/C MIX
PB AGC
AGC DET
P
R
PBY
2Vp-p
E-E OUT
21
1Vp-p
XF101/Q1001
LPF
Y/C SEP
25
3Vdc
1.4VdC
B1001
C1025
0.47μ
C1024
22μ
D1003
ST SL X2
D1001
PB H

AGC time-constant switching circuit
During recording : 0.47 μF + 22 μF
During playback : 0.47 μF only

Fig. 3

The recording system AGC circuit detects sync signal level and controls video signal level using the sync AGC system. Setting of this level is performed by changing the DC level at Pin ⑲ (EE LEVEL ADJ.).

1-3. Y/C SEPARATION (See Fig. 2 and Fig. 4.)

This unit uses an LC low-pass filter (XF101) to extract the Y component.

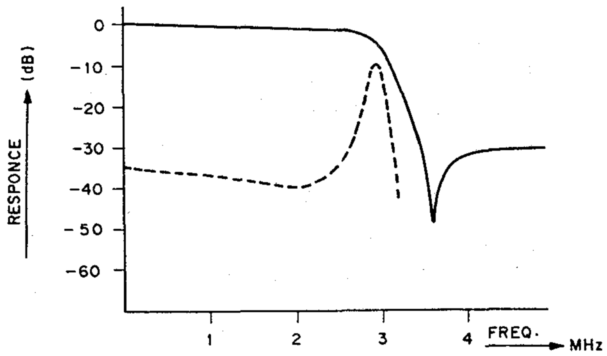


Fig. 4

1-4. DETAIL ENHANCER (See Fig. 2 and Fig 5.)

The detail enhancer slightly emphasizes signal components in the 1 to 3 MHz range according to input signal level (nonlinear characteristic) in order to obtain a clear profile reproduction. As shown in Fig. 5, the amount of enhancement increases with higher frequencies and lower input levels. Level is not restored to its original value during playback.

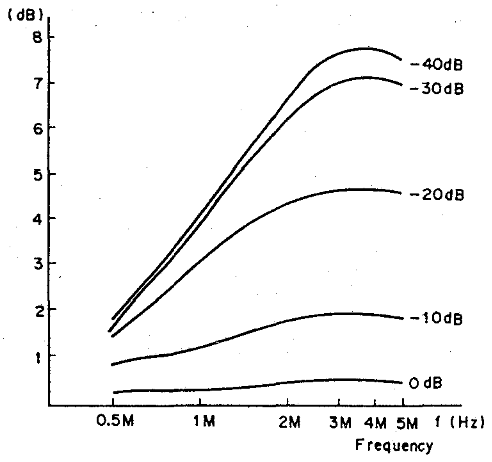


Fig. 5

1-5. NONLINEAR PRE-EMPHASIS (See Fig. 2 and Fig. 6.)

The purpose of nonlinear emphasis is to improve the S/N ratio for recording and playback in LP mode. Therefore, it is not applied in SP mode. Like the detail enhancer, also this circuit adjusts the amount of emphasis according to input signal level.

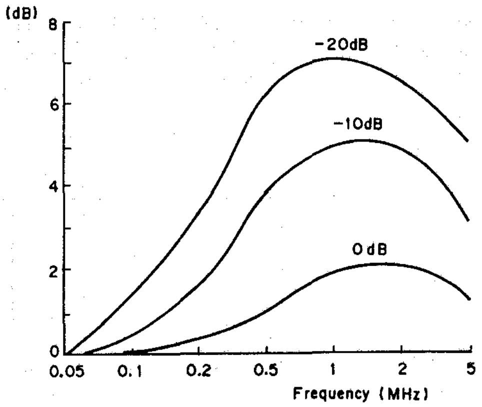


Fig. 6

Note : Nonlinear pre-emphasis is not applied in SP mode.

1-6. MAIN EMPHASIS (See Fig. 2 and Fig. 7.)

Main emphasis is applied according to the curve shown in Fig. 7 regardless of input level (fixed emphasis).

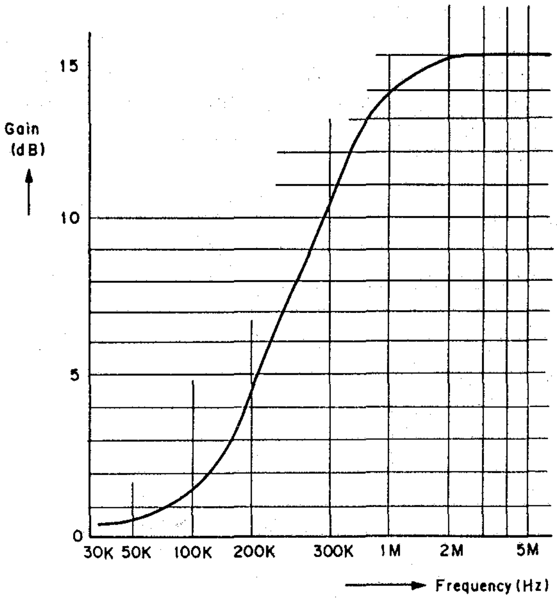


Fig. 7

When the frequency-modulated Y signal is demodulated, the amount of high-frequency noise increases. To solve this, high-frequency components are emphasized when recording, then attenuated when playing back. This suppresses noise components as well, thus improving the S/N ratio.

1-7. WHITE CLIP, DARK CLIP
(See Fig. 2 and Fig. 8.)

Overshoot and undershoot spike noise appears when high frequencies are emphasized in the emphasis circuit. If frequency modulation is applied in this condition, spike noise sections would be overmodulated. To prevent this, spike noise tips are cut off.

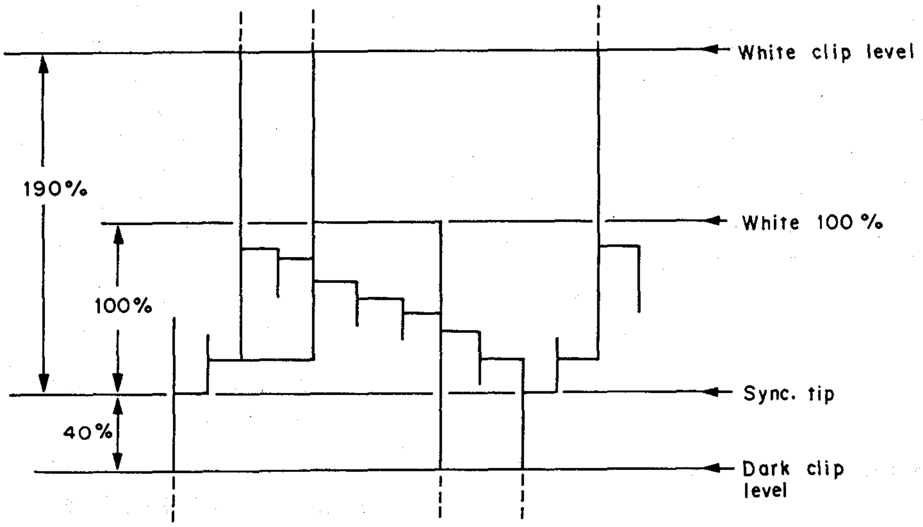

White clip level
190%
White 100 %
100%
Sync. tip
40%
Dark clip level

Fig. 8

1-8. FREQUENCY MODULATION
(See Fig. 2 and Fig. 9.)

After undergoing white clip and dark clip processing, the Y signal is frequency-modulated according to the characteristic shown in Fig. 9.

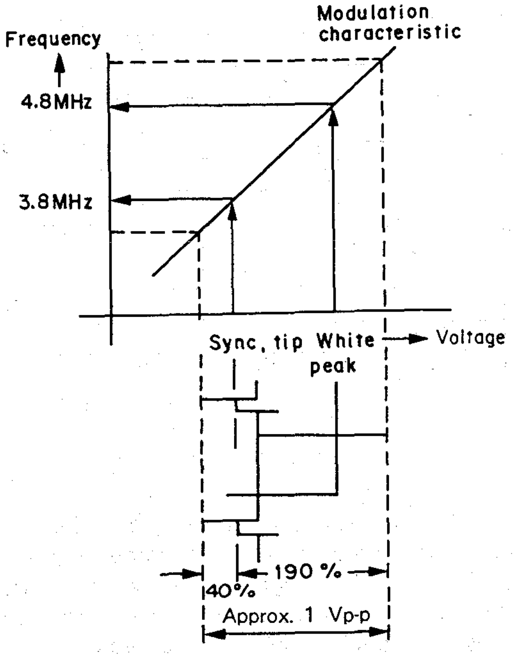
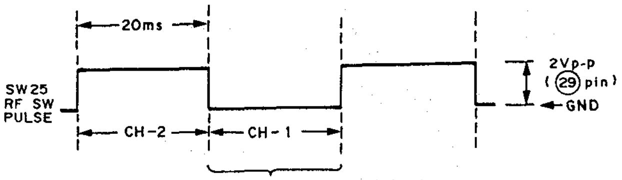

Frequency
Modulation characteristic
4.8MHz
3.8MHz
Sync. tip
White peak
Voltage
40%
190 %
Approx. 1 Vp-p

Fig. 9

[1/2 fH Carrier Shift] (See Fig. 2 and Fig. 10.)
In order to remove adjacent track crosstalk during playback mode, channel 1 carrier frequency is turned up approx. 7.8 kHz.
The carrier is turned up approx. 7.8 kHz during L period.


20ms
SW25
RF SW
PULSE
CH-2
CH-1
2Vp-p
(㉙ pin)
GND

Turn up the carrier approx. 7.8kHz during low.

Fig. 10

1-9. HEAD AMPLIFIER CIRCUIT

Four-head Type (IC181 : LA7321)

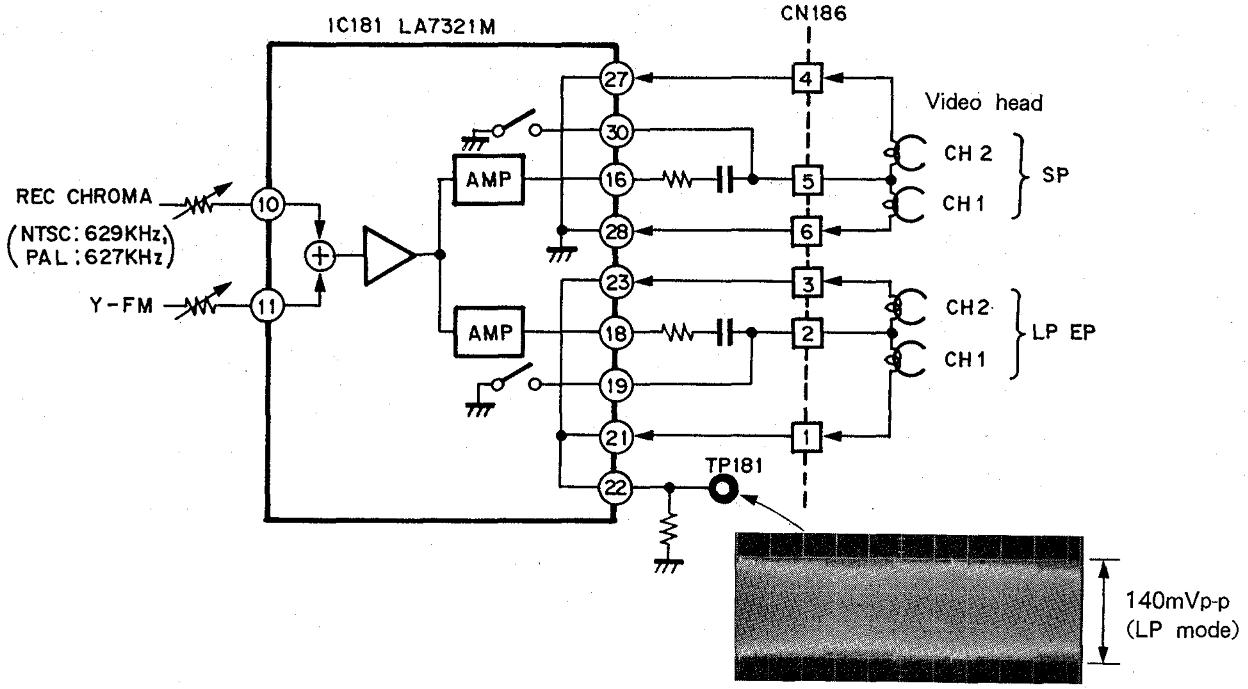
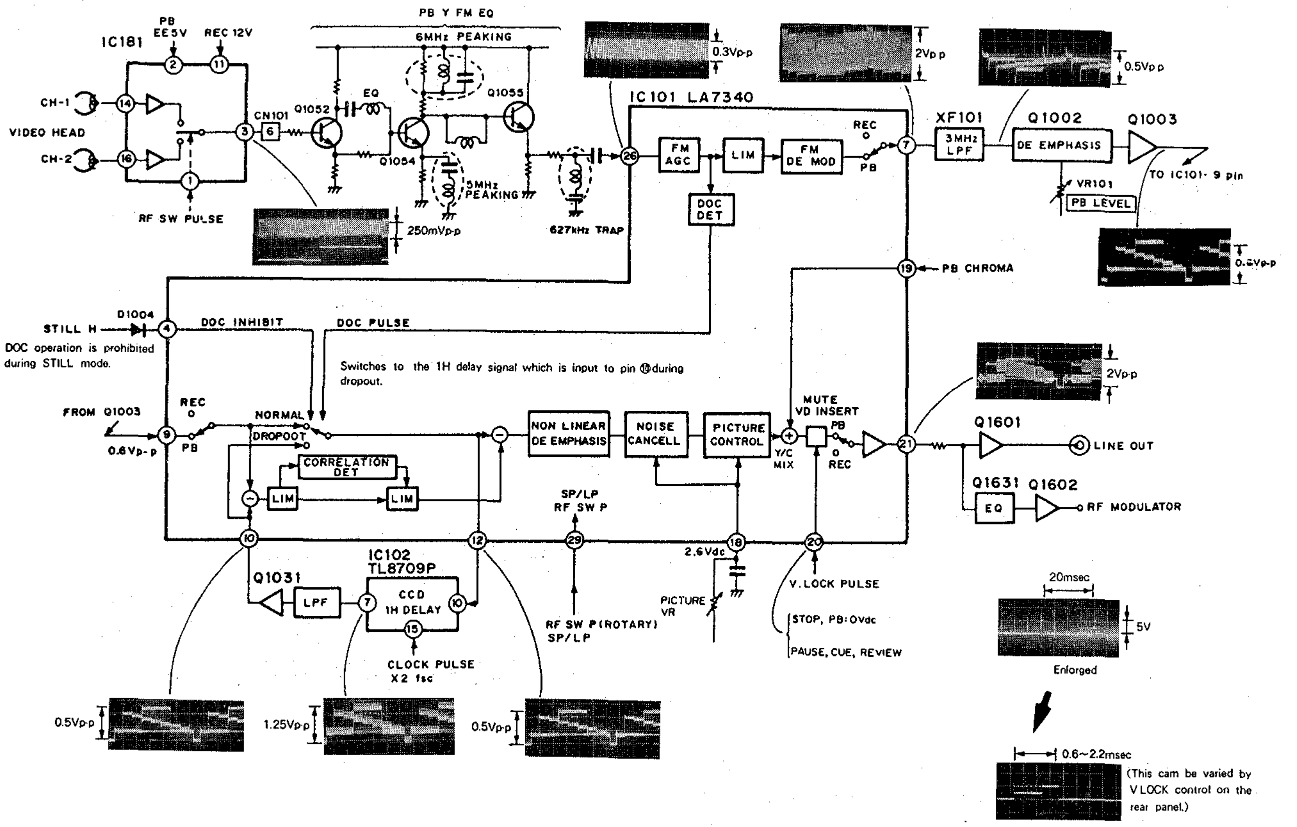

IC181 LA7321M
CN186
Video head
CH 2
CH 1
SP
CH2
CH 1
LP EP
REC CHROMA
(NTSC: 629KHz, PAL: 627KHz)
Y-FM
AMP
AMP
10
11
27
30
16
28
23
18
19
21
22
4
5
6
3
2
1
TP181
140mVp-p
(LP mode)

Fig. 11

The frequency-modulated Y signal input to Pin ⑪ and the chroma signal converted to low frequency inut to Pin ⑩ (627 kHz) are mixed at IC181, then the resulting signal is amplified and sent to the SP or LP video head through Pin ⑯ (in SP mode) or Pin ⑱ (LP modes).

2. LUMINANCE (Y) SIGNAL PLAYBACK SYSTEM


IC181
PB EE5V
REC 12V
CH-1
CH-2
VIDEO HEAD
14
16
2
11
3
1
RF SW PULSE
CN101
6
Q1052
EQ
PB Y FM EQ
6MHz PEAKING
Q1055
Q1054
5MHz PEAKING
627kHz TRAP
250mVp-p
0.3Vp-p
2Vp p
0.5Vp p
IC101 LA7340
26
FM AGC
LIM
FM DE MOD
DOC DET
REC
PB
7
XF101
3MHz LPF
Q1002
DE EMPHASIS
Q1003
TO IC101- 9 pin
VR101
PB LEVEL
0.6Vp-p
19
PB CHROMA
D1004
STILL H
4
DOC INHIBIT
DOC PULSE
FROM Q1003
0.6Vp-p
9
REC
PB
NORMAL
DROPOOT
CORRELATION DET
LIM
LIM
NON LINEAR DE EMPHASIS
NOISE CANCELL
PICTURE CONTROL
MUTE
VD INSERT
PB
REC
Y/C MIX
21
2Vp-p
Q1601
LINE OUT
Q1631
Q1602
EQ
RF MODULATOR
SP/LP
RF SW P
10
12
29
18
20
2.6Vdc
IC102
TL8709P
Q1031
LPF
7
CCD
1H DELAY
10
15
CLOCK PULSE
X2 fsc
RF SW P (ROTARY)
SP/LP
PICTURE VR
V.LOCK PULSE
STOP, PB: 0Vdc
PAUSE, CUE, REVIEW
0.5Vp-p
1.25Vp-p
0.5Vp-p
20msec
5V
Enforged
0.6~2.2msec

DOC operation is prohibited during STILL mode.

Switches to the 1H delay signal which is input to pin ⑩ during dropout.

(This cam be varied by VLOCK control on the rear panel.)

Fig. 12

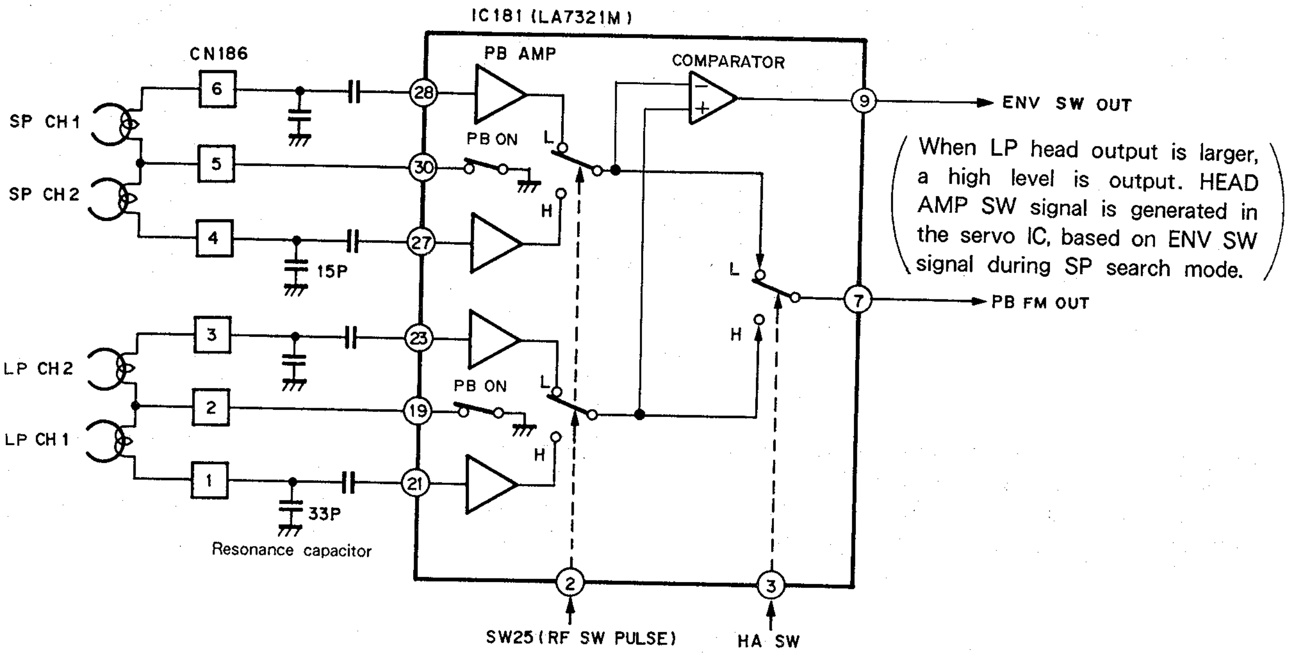
The RF signal picked up by the video head is input to IC181. There it is switched by SW25 (RF SW pulse), becoming a continuous signal. This RF signal passes through the equalizer circuit, then it is input to Pin ㉖ of IC101. This signal undergoes level adjustment at the FM AGC circuit, then it passes through the limiter circuit and is frequency-demodulated. Unnecessary components are removed from the modulated Y signal by a LPF, then its high-frequency components emphasized during recording are attenuated at the de-emphasis circuit.

The obtained signal passes through the H correlation noise reduction,non-linear de-emphasis and noise canceler circuits and it is mixed with the 4.43 MHz playback chroma signal, becoming the playback video signal. This signal passes through the mute and VD/HD insert circuits, then it is output to Pin ㉑. After this, it passes through the buffer and is output to the RF converter and the LINE OUT terminal.

2-1. HEAD AMPLIFIER

Four-head Type (IC181 : LA7321)

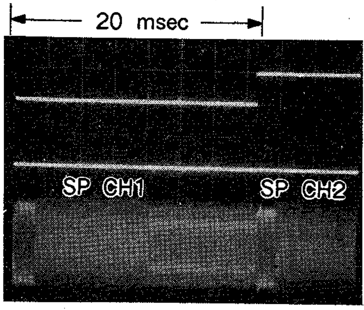
The RF signal picked up by the video head is input to Pins ㉗ and ㉘ of IC181 in SP mode and to Pins ㉑ and ㉓ in LP mode (Pins ㉑ and ㉓ are grounded by a switch in SP mode. The same happens to Pins ㉗ and ㉘ in LP mode. This switch is open during search). The RF signal input to IC181 is switched by the RF SW pulse, becoming a continuous signal, then SP/LP mode selection is performed by HA SW (search/still selection is performed as well) and the RF signal is output to Pin ⑦.


IC181 (LA7321M)
CN186
PB AMP
COMPARATOR
SP CH1
SP CH2
LP CH2
LP CH1
6
5
4
3
2
1
㉘
㉚
㉗
㉓
⑲
㉑
⑨
⑦
②
③
PB ON
PB ON
L
H
15P
33P
Resonance capacitor
ENV SW OUT
PB FM OUT
SW25 (RF SW PULSE)
HA SW

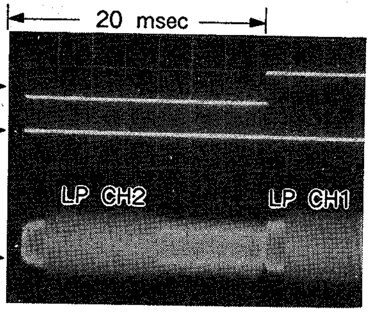
When LP head output is larger, a high level is output. HEAD AMP SW signal is generated in the servo IC, based on ENV SW signal during SP search mode.

Fig. 13

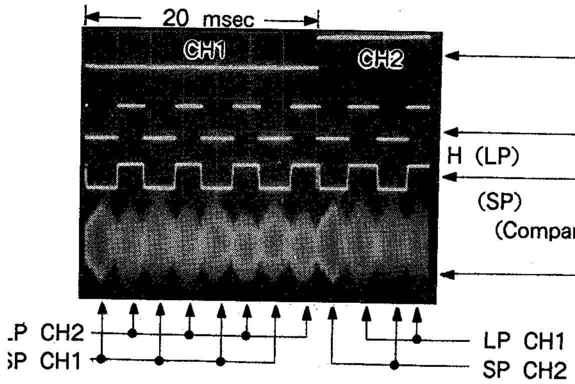
Ⓐ PLAY BACK (SP mode)



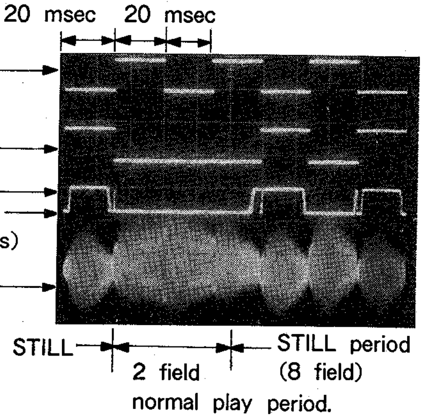
Ⓑ PLAY BACK (LP mode)



Ⓒ F. SEARCH (SP mode)



Ⓓ 1/5 SLOW (SP mode)



2-2. Playback Y Equalizer

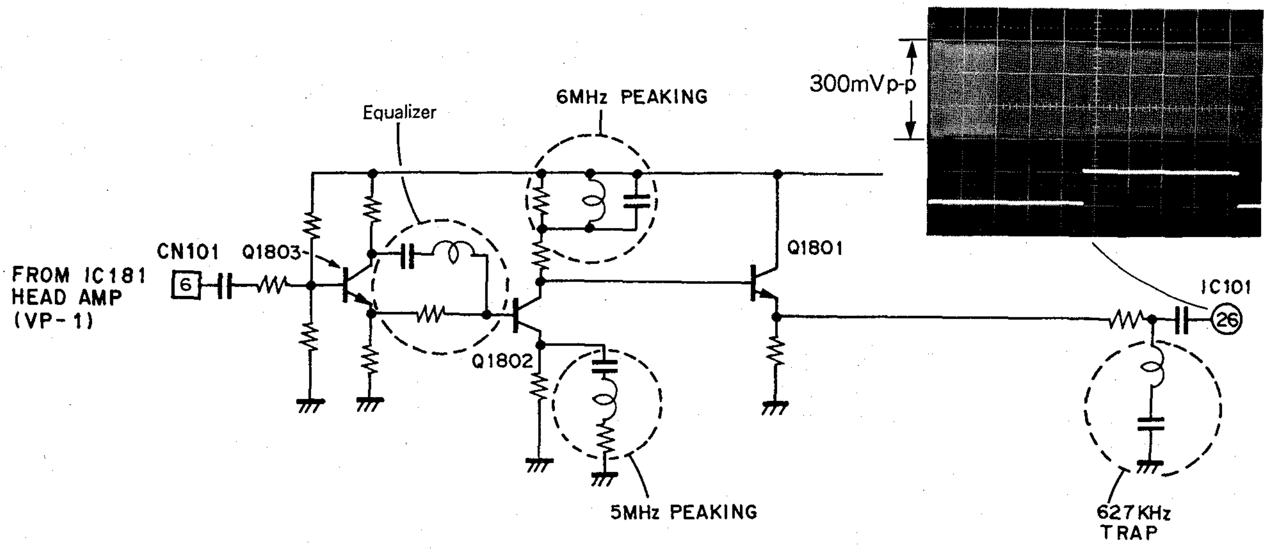

Equalizer
6MHz PEAKING
300mVp-p
CN101
Q1803
FROM IC181
HEAD AMP
(VP-1)
6
Q1801
IC101
26
Q1802
5MHz PEAKING
627KHz
TRAP

Fig. 14

The low-frequency converted chroma components are removed from the playback Y-FM signal by a 627 kHz trap, then its high-frequency components are emphasized by the 5 MHz peaking circuit to flatten its overall frequency characteristic. Phase correction is applied at the equalizer circuit, and high-frequency components are removed at a 7.2 MHz trap.

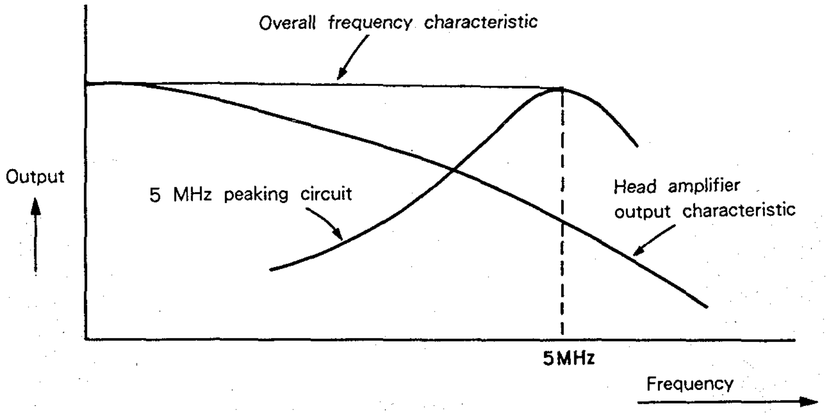


Fig. 15

2-3. FM AGC (See Fig. 12.)

This circuit eliminates output level fluctuation due to tape speed (LP/SP mode) switching and head unevenness.

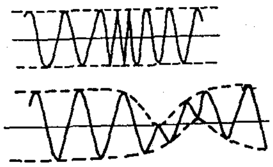
2-4. LIMITER (See Fig. 12.)

This circuit removes AM fluctuation and prevents the reversion phenomenon.

[Reversion Phenomenon]

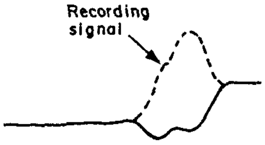
Recording
FM signal

Playback
FM signal



At the point where change occurs from black to white, part of the waveform does not cross zero, and it is distorted like oscillation.

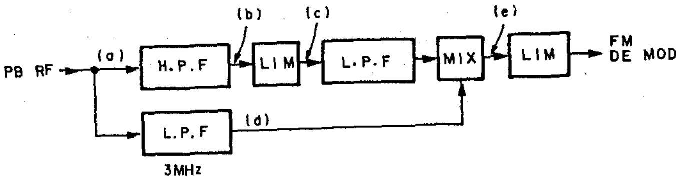
Recording signal
Playback Y signal

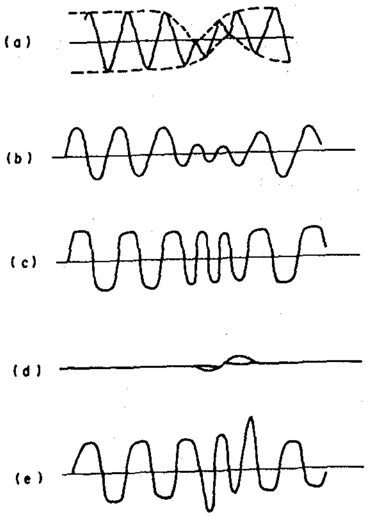


Although signal must originally rise as a white peak, it remains at the black level (reversed) because zero-crossing interval appears to widen due to its absence at this point.

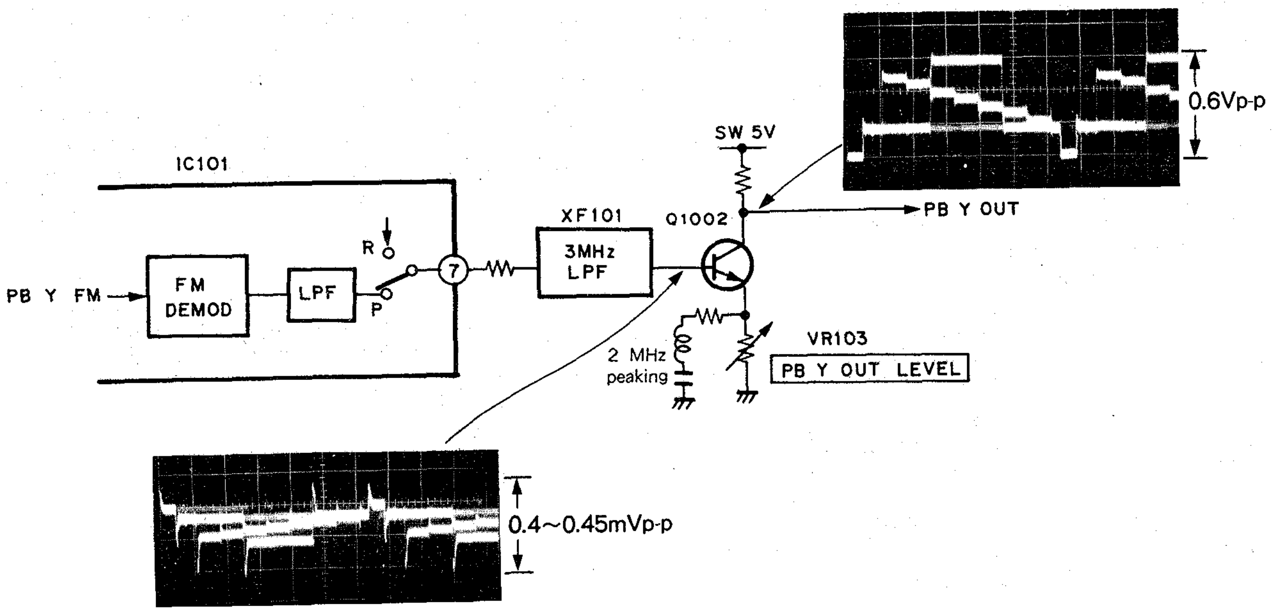
[Double Limiter]

High-frequency components of the playback RF signal are emphasized by a HPF, thus shaping its waveform so as to prevent the above-mentioned zero-cross distortion. Then the low-frequency component (d) extracted by a LPF is added to the signal to correct phase distortion, and the signal passes through the limiter again to remove its AM fluctuation component.





2-5. FREQUENCY DEMODULATION, LPF (See Fig. 12 and Fig. 16.)

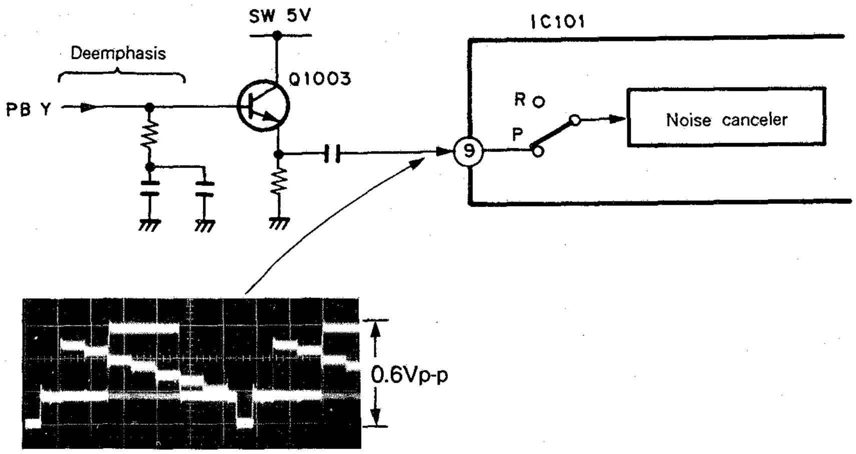


IC101
PB Y FM
FM DEMOD
LPF
R
P
7
XF101
3MHz LPF
Q1002
SW 5V
PB Y OUT
2 MHz peaking
VR103
PB Y OUT LEVEL
0.6Vp-p
0.4~0.45mVp-p

Fig. 16

The frequency-modulated Y signal is turned back to the original video signal. The LPF (XF101) removes unnecessary signal components and integrates the output signal to obtain the demodulated signal.

2-6. DE-EMPHASIS (See Fig. 12 and Fig. 17.)



SW 5V
Deemphasis
PB Y
Q1003
IC101
R
P
9
Noise canceler
0.6Vp-p

Fig. 17

The high-frequency components emphasized during recording are attenuated by this circuit . Simultaneously, noise components are suppressed to improve playback Y signal S/N ratio.

2-7. DROPOUT COMPENSATION, HORIZONTAL CORRELATION NOISE REDUCTION (See Fig. 18)

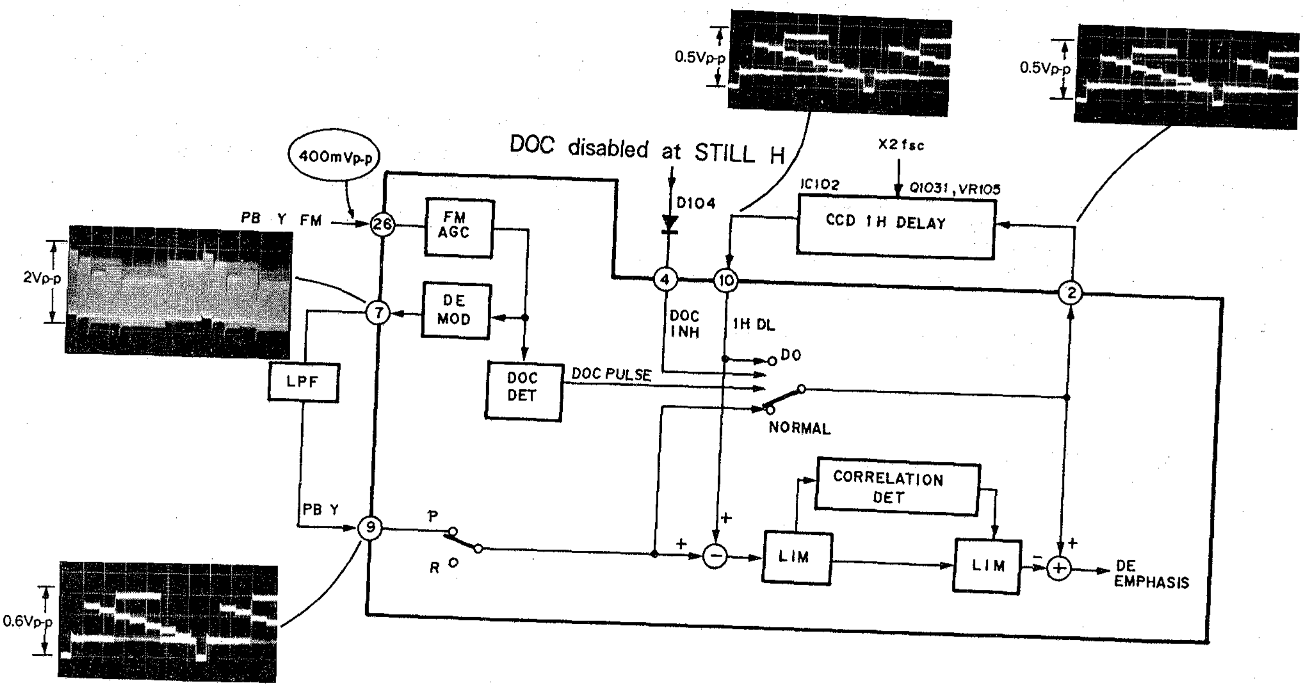

0.5Vp-p
0.5Vp-p
400mVp-p
DOC disabled at STILL H
X2fsc
IC102
Q1031, VR105
D104
CCD 1H DELAY
PB Y FM
26
FM AGC
2Vp-p
7
DE MOD
4
10
2
DOC INH
1H DL
DO
LPF
DOC DET
DOC PULSE
NORMAL
CORRELATION DET
PB Y
9
P
R
+
−
LIM
LIM
+
−
+
DE EMPHASIS
0.6Vp-p

Fig. 18

[Dropout Compensation]
After passing through the FM AGC circuit, the Y-FM signal undergoes envelope detection at the DOC DET circuit. When a dropout is found, the IC internal switch is set to the DO side. While the dropout pulse is present, it is replaced by the signal as it was 1H before. In the still mode, voltage at Pin ④ is set to the high level to disable DOC circuit operation. This is to increase the width of the DOC pulse.

which is sent to the system control microprocessor for noise shifting during still-picture playback.

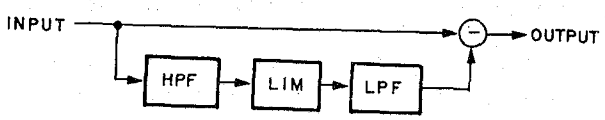
[Horizontal Correlation Noise Reduction]
This system uses luminance signal correlation to reduce noise. The playback Y signal input to Pin ⑨ and the 1H DL signal input to Pin ⑩ are compared to each other, and the difference component (equivalent to the noise) is extracted. This component passes through a limiter, then it is added to the playback Y signal with its phase reversed, thus canceling noise. When the signal has no correlation any more, limiter output is lowered to stop correlation DET circuit operation.

2-8. NONLINEAR DE-EMPHASIS (See Fig. 12.)

Signal components emphasized during recording are attenuated by the same amount.
Note : Nonlinear de-emphasis is not applied in SP mode.

2-9. NOISE CANCELER (See Fig. 12.)

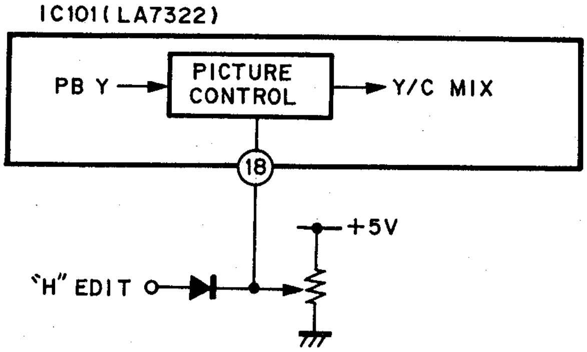
Removes high-frequency noise from the luminance signal.
[Principle of Operation]


INPUT
HPF
LIM
LPF
−
OUTPUT

The high-frequency component is extracted by the high-pass filter, then the signal component is removed by the limiter. The resulting signal is added to the input signal at reverse phase, thus canceling noise.

2-10. PICTURE CONTROL, EDIT (See Fig. 13.)

This IC allows to adjust playback picture sharpness by changing DC voltage at Pin ⑱. Furthermore, when pulled-up by approx. 5V it sets the edit mode, turning off the detail enhancer, line NC and picture control circuits.


IC101(LA7322)
PB Y
PICTURE CONTROL
Y/C MIX
18
+5V
"H" EDIT

2-11. Y/C MIX (See Fig. 12.)

This circuit mixes the 4.43 MHz chroma playback signal with the Y signal, producing the video signal.

2-12. MUTE, VD INSERT (See Fig. 12 and Fig. 19.)

This circuit mutes output immediately after the playback mode is set and inserts a dummy vertical sync signal during variable speed playback, among other functions.

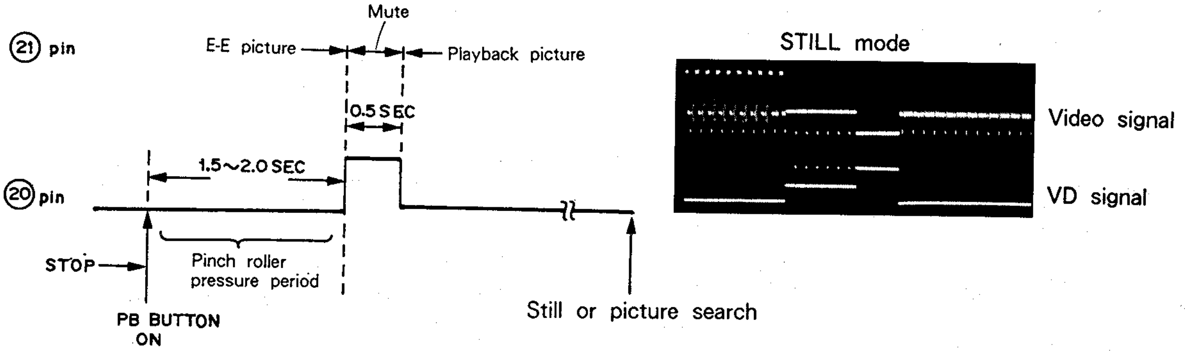

Mute
㉑ pin
E-E picture
Playback picture
0.5 SEC
1.5~2.0 SEC
⑳ pin
STOP
Pinch roller pressure period
PB BUTTON ON
Still or picture search
STILL mode
Video signal
VD signal

Fig. 19

[Explanation of Pin ⑳]
Pin ⑳ is used to control the insertion of MUTE, HD and VD signals. It responds to the following three levels :

"L" ··· The input signal is output as it is.
"M" ··· Pedestal mute (the output signal is fixed to the pedestal level)
"H" ··· Sync-tip mute (the output signal is fixed to the sync-tip level)

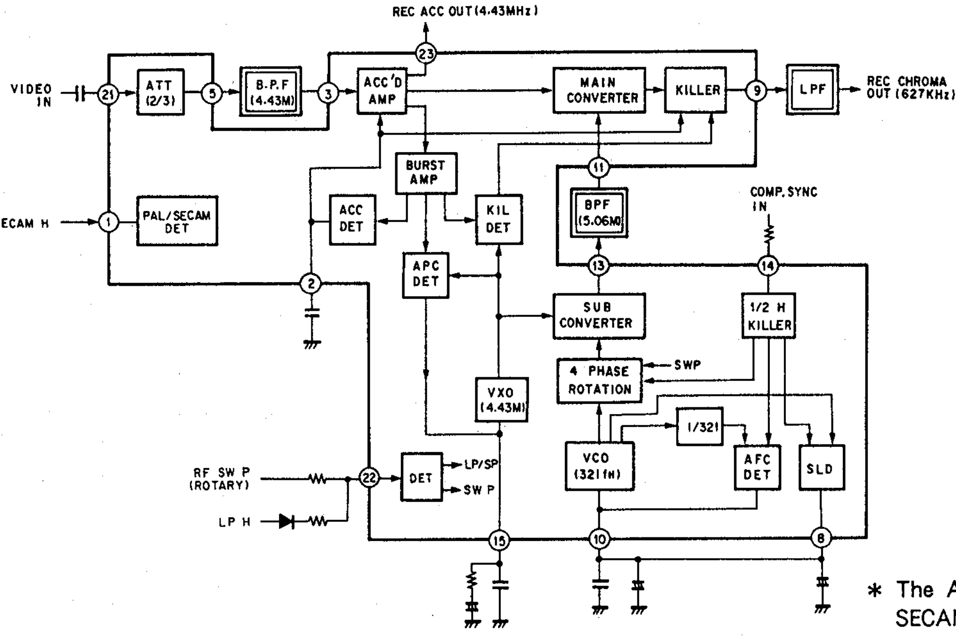
As shown in Fig. 19, level is normally "L", changing to "H" at the beginning of playback to mute the output signal and prevent the output of irregular sync picture and sound. During the still and picture search modes, a dummy VD signal is inserted to prevent vertical sync distortion.

3. CHROMA SIGNAL PROCESSING CIRCUIT

Chroma signal processing is performed at IC111 (LA7332) for both recording and playback.
The chroma signal processing circuit comprises two signal paths ; one for the chroma signal itself and the other for control signals. These will be called the signal system and the control system, respectively, in the following explanations.

3-1. RECORDING MODE

◦ REC MODE (IC111 : LA7332)

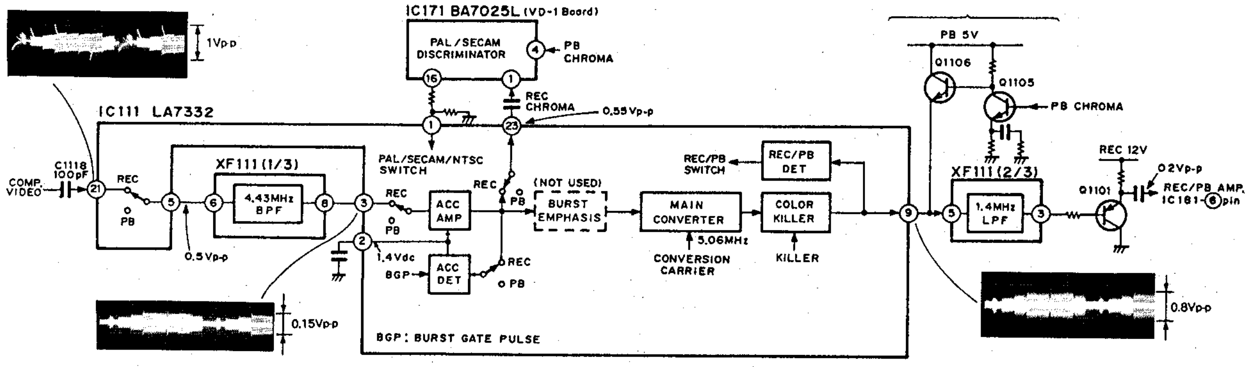


REC ACC OUT (4.43MHz)
VIDEO IN
ATT (2/3)
B.P.F (4.43M)
ACC'D AMP
MAIN CONVERTER
KILLER
LPF
REC CHROMA OUT (627KHz)
SECAM H
PAL/SECAM DET
BURST AMP
ACC DET
KIL DET
APC DET
BPF (5.06M)
COMP. SYNC IN
SUB CONVERTER
1/2 H KILLER
4 PHASE ROTATION
SWP
VXO (4.43M)
1/321
RF SW P (ROTARY)
LP H
DET
LP/SP
SW P
VCO (321fH)
AFC DET
SLD
21
5
3
23
9
1
11
2
13
14
22
15
10
8

Fig. 20

* The APC loop is not used for SECAM signal processing (only for AFC control). 4-phase rotation is not used either.

Chroma signal flow in the recording mode is as follows.
The composite video signal to be recorded passes through C1118 (100 pF), it is input to Pin ㉑, has its level reduced by approx. 2/3 times and is output from Pin ⑤. Then it passes through a 4.43 MHz BPF (Pins ⑥, ⑦ and ⑧ of XF111), only the chroma signal is extracted and input to Pin ③. This signal is sent to the ACC amplifier. Gain of this device is controlled by the DC voltage at Pin ②. Its output is sent to the main converter and to the level detector (ACC DET.). The output from this detector is smoothed by the filter capacitor (C1101, 0.022 μF) attached to Pin ②, then it is fed back into the ACC amplifier to keep the output burst level of this amplifier constant.
The chroma signal, converted to 627 kHz by the main converter, passes through the killer circuit and is output from Pin ⑨. Its unnecessary components are then removed by a 1.4 MHz LPF (Pins ③, ④ and ⑤ of XF111), it passes through the buffer amplifier (Q1101) and is sent to VP-1.

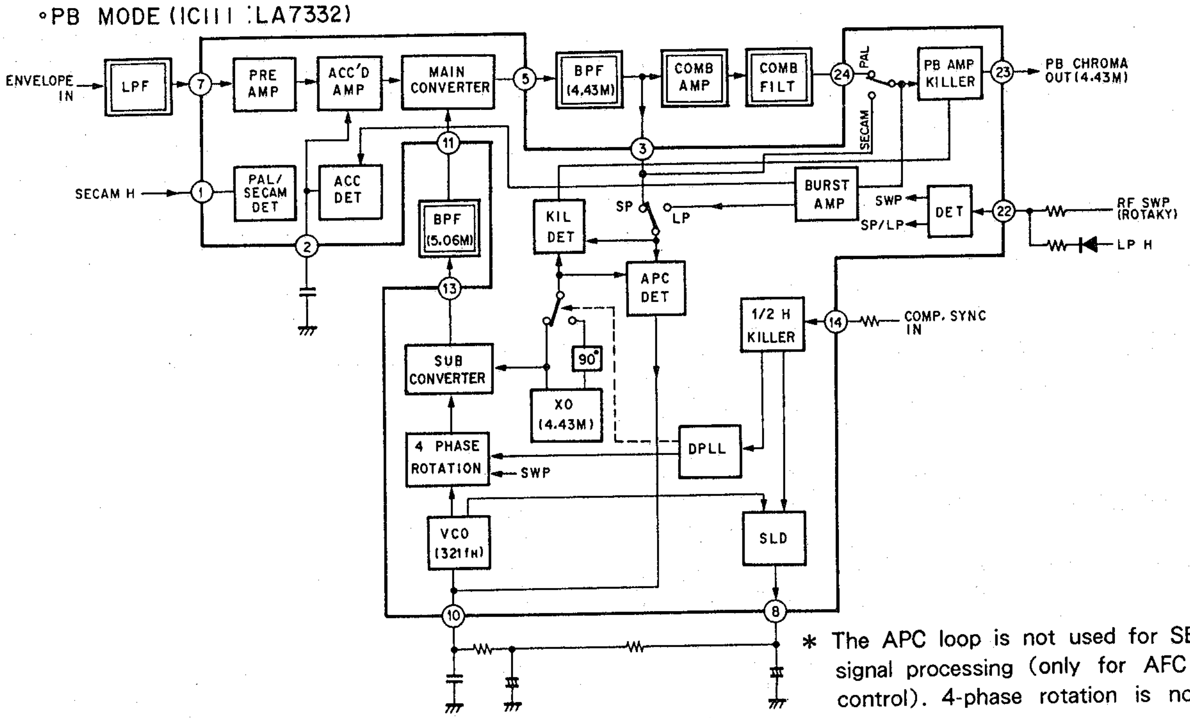


1Vp-p
IC171 BA7025L (VD-1 Board)
PAL/SECAM DISCRIMINATOR
PB CHROMA
REC CHROMA
0.55Vp-p
IC111 LA7332
PAL/SECAM/NTSC SWITCH
C1118 100pF
COMP. VIDEO
REC
PB
XF111 (1/3)
4.43MHz BPF
0.5Vp-p
ACC AMP
(NOT USED)
BURST EMPHASIS
REC/PB SWITCH
REC/PB DET
MAIN CONVERTER
COLOR KILLER
5.06MHz CONVERSION CARRIER
KILLER
1.4Vdc
BGP
ACC DET
0.15Vp-p
BGP : BURST GATE PULSE
PB 5V
Q1106
Q1105
PB CHROMA
REC 12V
XF111 (2/3)
1.4MHz LPF
Q1101
0.2Vp-p
REC/PB AMP. IC181-⑥pin
0.8Vp-p

Fig. 21

3-2. PLAYBACK MODE

∘PB MODE (IC111 :LA7332)

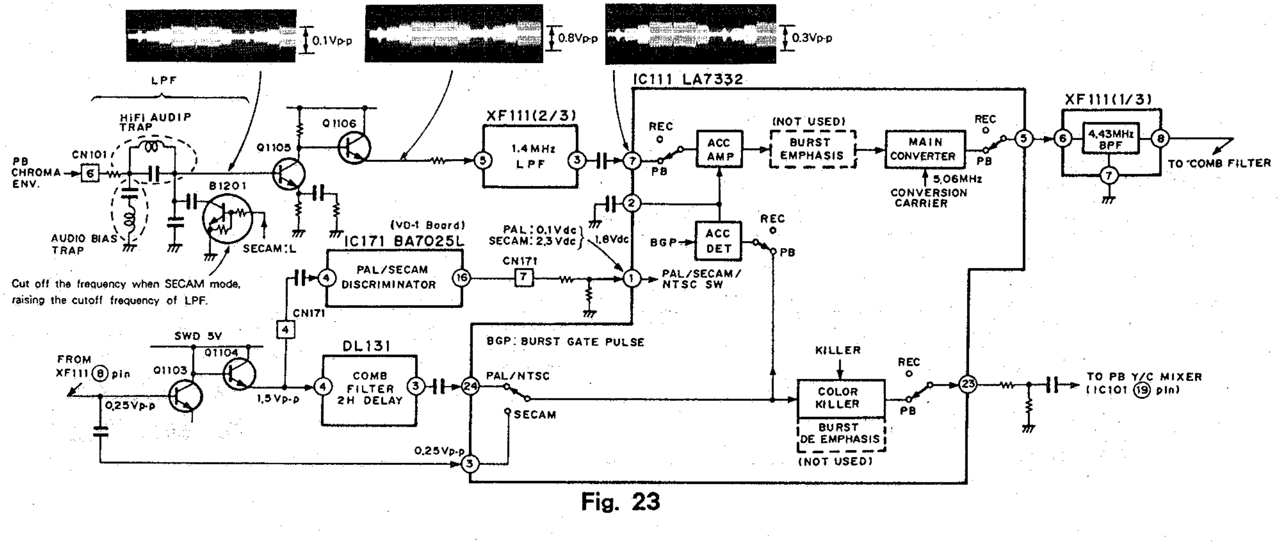


ENVELOPE IN
LPF
PRE AMP
ACC'D AMP
MAIN CONVERTER
BPF (4.43M)
COMB AMP
COMB FILT
PAL
SECAM
PB AMP KILLER
PB CHROMA OUT (4.43M)
SECAM H
PAL/SECAM DET
ACC DET
BPF (5.06M)
KIL DET
SP
LP
BURST AMP
SWP
SP/LP
DET
RF SWP (ROTAKY)
LP H
APC DET
1/2 H KILLER
COMP. SYNC IN
SUB CONVERTER
90°
XO (4.43M)
4 PHASE ROTATION
SWP
DPLL
VCO (321fH)
SLD

Fig. 22

* The APC loop is not used for SECAM signal processing (only for AFC control). 4-phase rotation is not used either.
* The SECAM playback signal is output bypassing the comb filter.

Chroma signal flow in the playback mode is as follows.
After being amplified at the preamplifier, the playback signal passes through a somewhat light LPF, then it is amplified by Q1105 and input to the base of the buffer amplifier Q1106. This component has two functions : First, it controls Pin ⑨, which is the color system IC recording/playback mode switching terminal. The playback mode is set when level at Pin ⑨ reaches 2.1V. Second, it inputs the playback low-frequency chroma signal to the 1.4 MHz LPF (Pins ③, ④ and ⑤ of XF111). This LPF extracts only the low-frequency converted chroma signal, which is then input to Pin ⑦. This signal passes through the 6 dB and ACC amplifiers and is input to the main converter. There it is converted to 4.43 MHz and output from Pin ⑤, then its unnecessary frequency components are removed by the 4.43 MHz BPF (Pins ⑥, ⑦ and ⑧ of XF111) and it is input to the comb amplifier. This device compensates for comb filter loss.
Adjacent track crosstalk component is removed from the signal output from the comb filter, then it is input to Pin ㉔, it passes through the killer circuit and is output from Pin ㉓.
After the above processing, the chroma signal is sent to the Y/C mix terminal of IC101, where the luminance signal is processed.



0.1Vp-p
0.8Vp-p
0.3Vp-p
LPF
HiFi AUDIO TRAP
PB CHROMA ENV.
CN101
AUDIO BIAS TRAP
B1201
Q1105
Q1106
SECAM:L
Cut off the frequency when SECAM mode, raising the cutoff frequency of LPF.
XF111(2/3)
1.4MHz LPF
(VD-1 Board)
IC171 BA7025L
PAL/SECAM DISCRIMINATOR
PAL: 0.1Vdc
SECAM: 2.3Vdc
1.8Vdc
CN171
IC111 LA7332
REC
PB
ACC AMP
(NOT USED)
BURST EMPHASIS
MAIN CONVERTER
5.06MHz CONVERSION CARRIER
XF111(1/3)
4.43MHz BPF
TO COMB FILTER
BGP
ACC DET
PAL/SECAM/NTSC SW
SWD 5V
FROM XF111 ⑧ pin
Q1103
Q1104
0.25Vp-p
1.5Vp-p
DL131
COMB FILTER 2H DELAY
BGP: BURST GATE PULSE
PAL/NTSC
SECAM
KILLER
COLOR KILLER
BURST DE EMPHASIS
(NOT USED)
TO PB Y/C MIXER (IC101 ⑲ pin)

Fig. 23

3-3. EXPLANATION OF THE CIRCUIT BLOCKS (see Figs. 20 and 22)

1. ACC Circuit (automatic color level control)

During recording, this circuit curbs fluctuation of the 4.43 MHz input carrier chroma signal to keep chroma recording current constant. During playback, it keeps level of the 627 kHz low-frequency chroma signal constant. This circuit prevents the flicker occurred when there is a large difference between channel 1 and channel 2 head outputs.

The ACC circuit of this unit consists of a burst ACC circuit that detects burst signal level both during recording and playback.

The signal from the ACC amplifier is sent to the level detector (ACC DET), where its difference with the reference level is detected and output as a DC potential. The signal is then smoothed by the capacitor attached externally to Pin ② and fed back to the ACC amplifier. Gain of this amplifier depends on the potential at the control terminal. For example, when input signal level is high, gain is reduced to obtain the reference level at the output.

2. ACK Circuit (automatic color killer circuit)

When a black-and-white signal is input, the ACC circuit amplifies the noise signal and records it along with the Y-FM signal. The ACK circuit prevents the adverse effect (blurred color output in spite of the black-and-white program) produced when the above signal is played back.

Two methods are used together for a secure killing operation : Peak detection, which detects the color signal input level before applying the killer (killer : on when −20 dB to the reference input level) and sync detection, which applies the killer after detecting whether the burst signal is present or not.

3. Main Converter Circuit

This circuit is used to convert the 4.43 MHz carrier chroma signal to 627 kHz low-frequency and the 627 kHz chroma signal to 4.43 MHz. It is provided with two input terminals. At the output terminal, frequency components resulting of adding and subtracting both inputs are obtained.

During recording, the 4.43 MHz chroma signal from the ACC circuit and the 5.06 MHz signal generated by the APC circuit are input. At the output, signals of 4.43 MHz + 5.06 MHz = 9.49 MHz and 5.06 MHz − 4.43 MHz = 627 kHz are obtained. These signals are passed through a 1.4 MHz LPF to get only the required 627 kHz low-frequency converted chroma signal.

During playback, the 627 kHz and 5.06 MHz signals are input, turning into 4.43 MHz and 5.69 MHz at the output. The carrier chroma signal is obtained by passing this signal through a BPF, thus separating the required 4.43 MHz chroma signal.

3-4. CHROMA PROCESSING CONTROL SYSTEM

1. Principles of Jitter Removal (APC circuit during playback)

In rotating head video decks, jitter (fluctuation on the time axis) is produced in the playback signal due to factors such as drum rotation irregularity, tape stretching and shrinking, speed changes in the tape transport system, etc. Jitter results in color subcarrier instability (fsc : 4.43 MHz) and the subsequent changes in phase. This produces changes in playback picture hue and saturation, definitely deteriorating picture quality. The APC circuit is used to prevent this.

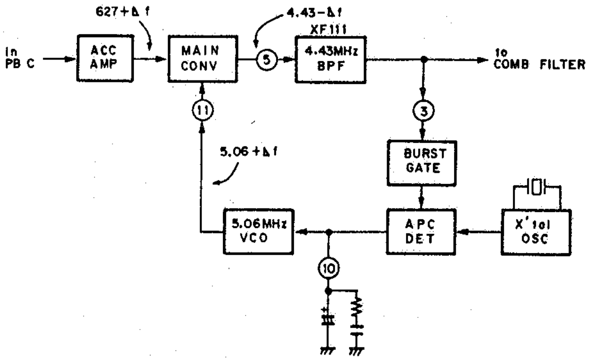


Fig. 24

The low-frequency converted playback chroma signal from the ACC circuit is input to one terminal of the main converter, and the carrier signal converted to 5.06 MHz to the other, thus recovering the original 4.43 MHz chroma signal.

The main flow of this signal goes into the comb filter. The separated branch is input to Pin ③, then it passes through the burst gate and is input to the phase comparator (APC DET). This comparator is also supplied with a 4.43 MHz accurately generated by the crystal oscillator. These two signals are phase-compared. If the playback signal is advanced phase, the error output potential is lowered ; if it is delayed, the error output potential is turned up.

This potential is smoothed at a filter (accessed through Pin ⑩) composed of a resistor and a capacitor, then it is input to the control terminal of the 5.06 MHz VCO (voltage-controlled oscillator) to control its oscillation frequency.

The above-mentioned jitter appears as a difference from the reference frequency (4.43 MHz), i.e. a phase deviation, when the signal is converted back to its original frequency. Let's suppose a +Δf jitter is contained in the 627 kHz chroma signal. The other input of the main converter is a single-frequency 5.06 MHz signal, so its output shall be :

$$5.06 - (0.627 + \Delta f) = 4.43 - \Delta f \text{ (MHz)}$$

APC DET error output potential goes up by just the $-\Delta f$ delayed phase amount, as well as the VCO oscillation frequency.

Frequency of the converted carrier signal input to the main converter becomes $5.06 + \Delta f$ MHz, and the output becomes

$$5.06 + \Delta f - (0.627 + \Delta f) = 4.43 \text{ (MHz)}$$

The circuit works in the same way for removing $-\Delta f$ jitter. This process is called an APC loop.

Note 1 : On the 5.06 MHz VCO
In the general block diagram it is seen as composed by the VCO itself (5.015 MHz), 4-phase rotation and sub conv., but in the explanation it is referred to as just 5.06 VCO and one block for the sake of simplicity.

Note 2 : Principle of operation of the APC DET (phase comparator)

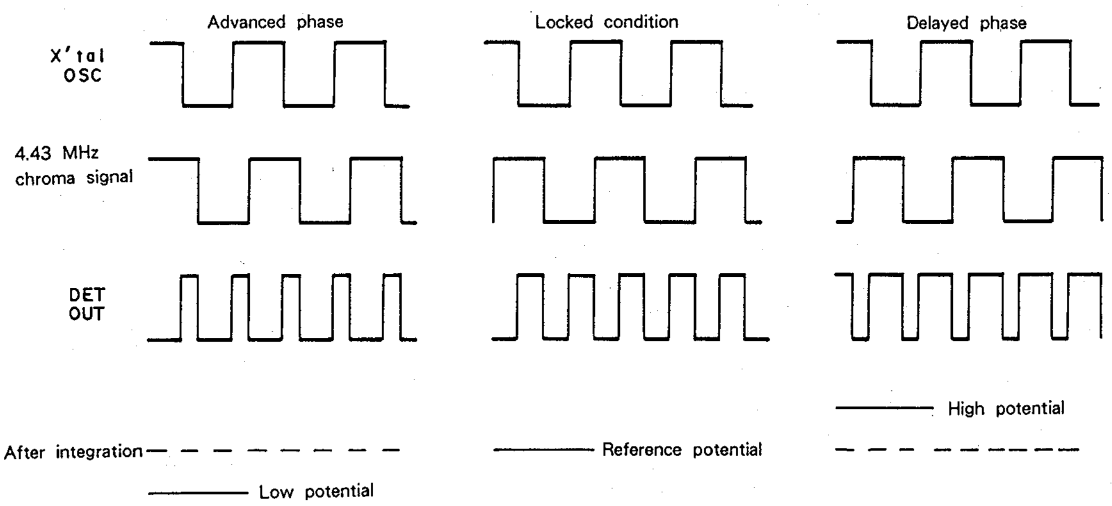

Advanced phase
Locked condition
Delayed phase
X'tal OSC
4.43 MHz chroma signal
DET OUT
High potential
After integration
Reference potential
Low potential

Fig. 25

[APC loops for each mode]

A quicker response and a better PM noise reduction can be obtained by diverting the burst signal for input to APC DET before the 2H comb filter. In the LP mode, however, the APC loop would be adversely affected by the large crosstalk, lowering the S/N ratio. Therefore, the burst signal is diverted after the comb filter in this case.

The APC loop is set as shown below for each tape speed and video standard.

System / Tape Speed	PAL	ME SECAM
SP	Before the comb filter (Pin ③ input)	The APC loop is not used.
LP	After the comb filter (Pin ㉔ input)	

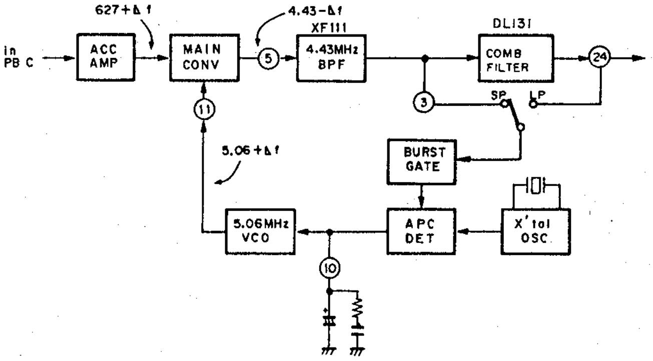

in PB C
ACC AMP
627+Δf
MAIN CONV
4.43−Δf
⑤
XF111
4.43MHz BPF
DL131
COMB FILTER
㉔
③
SP
LP
⑪
5.06+Δf
BURST GATE
5.06MHz VCO
APC DET
X'tal OSC
⑩

Fig. 26

2. PS (Phase Shift) Color System

(1) Crosstalk Removal Using a Comb Filter

There are no guard bands between video tracks recorded on tape. Therefore, crosstalk from adjacent tracks during playback is a problem to be considered. Crosstalk in the frequency-modulated luminance signal is dealt with by the azimuth effect, but in the low-frequency converted chroma signal the azimuth effect alone is not enough to remove crosstalk. To solve this, the PS color system was developed. This system takes advantage of the line correlativity of video signals (the fact that adjacent signals are practically equal).

Fig. 27 shows the phase of tracks recorded on a tape. When comparing channel 1 and channel 2, we see that channel 2 is recorded by rotating the phase 90° at 1H intervals. This is why this system is called PS (phase shift) color system.

Let's have a look first at channel 1 playback. In Fig. 27, solid-line arrows indicate the channel 1 signal, and small dotted-line arrows show crosstalk components from channel 2. Now observe that signal sectors located 2H from each other have solid-line arrows pointing in the same direction and dotted-line arrows pointing in opposite directions. Thus, crosstalk components can be removed by adding the 2H delayed signal to the original one using a comb filter.

Next, let's examine channel 2 playback. Since phase of channel 2 is shifted 90° during recording, the signal must be restored to its original phase. If phase is advanced 90° at 1H intervals, the main signal gets in phase with the signal sector located 2H away from it (and the respective crosstalk components get opposite phases) like in channel 1, allowing for crosstalk removal by means of a comb filter.

[MESECAM mode]

The PS color recording system, in which the channel-2 signal is phase-shifted, is not used for SECAM chrominance signal processing. Therefore, the signal is diverted to the output (Pin ③) before the comb filter (2H delay) during SECAM playback.

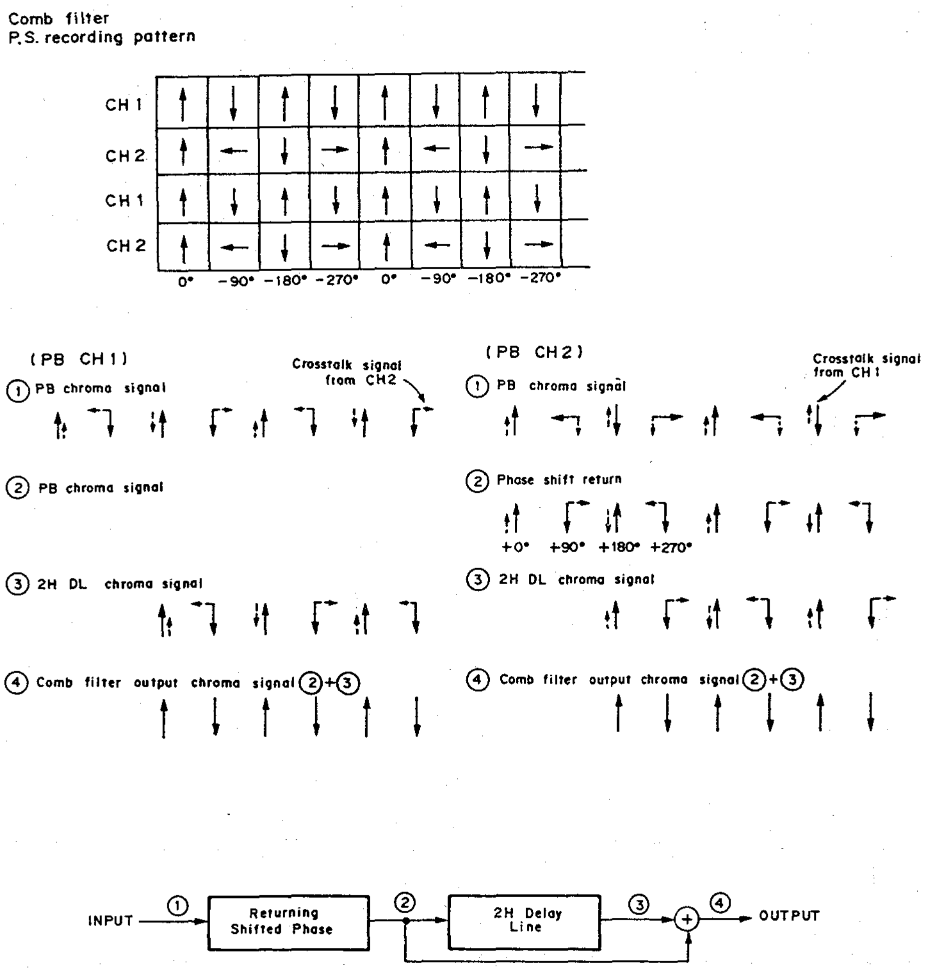

Comb filter
P.S. recording pattern
CH 1
CH 2
CH 1
CH 2
0° −90° −180° −270° 0° −90° −180° −270°
(PB CH 1)
① PB chroma signal
Crosstalk signal from CH2
② PB chroma signal
③ 2H DL chroma signal
④ Comb filter output chroma signal ②+③
(PB CH 2)
① PB chroma signal
Crosstalk signal from CH 1
② Phase shift return
+0° +90° +180° +270°
③ 2H DL chroma signal
④ Comb filter output chroma signal ②+③
INPUT
①
Returning Shifted Phase
②
2H Delay Line
③
+
④
OUTPUT

Fig. 27

(2) Phase Shift Circuit

To make crosstalk removal with a comb filter possible, phase of the chroma signal has to be securely shifted every 90 ° . The frequency conversion carrier signal input to the main converter for shifting purposes is phase-shifted. To do this, a certain phase relation between this carrier signal (5.06 MHz) and the input chroma signal (4.43 MHz or 627 kHz) has to be maintained. This is achieved using the APC, AFC and 4-phase shift circuits.

① APC Circuit

This circuit matches phase of the carrier signal input to the sub converter to that of the chroma signal burst component. The ACC amplifier output passes through the burst gate, and only the burst component is input to the phase comparator (APC DET). This comparator is also supplied with the signal from the VXO (variable crystal oscillator), so the phases of both signals are compared and their error difference is output to Pin ⑮. This output is then smoothed by the filter of Pin ⑮, and VXO oscillation frequency is controlled so that phase matches with that of the burst signal.

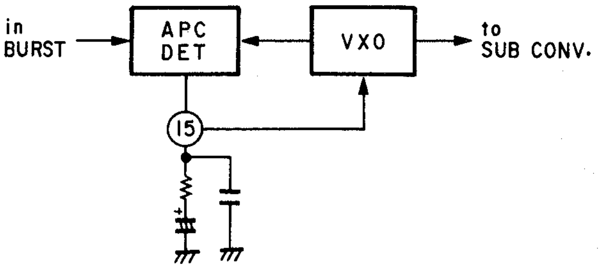


Fig. 28

② AFC Circuit

This circuit consists of a VCO PLL (Phase-Locked Loop) that locks the VCO oscillation frequency to a frequency equal to 321 times that of the recorded signal horizontal sync component.

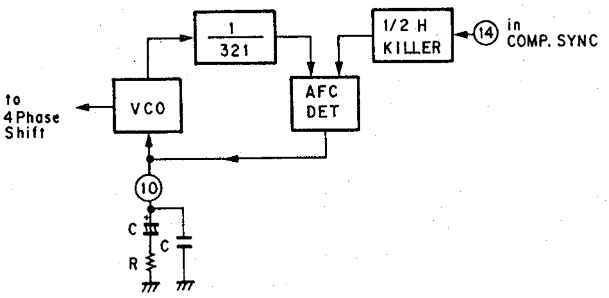


Fig. 29

H pulse (ⓑ) with its equalization period removed by passing the composite sync signal (ⓐ) through a 1/2H killer circuit is generated. Duty of this signal is 50%.

On the other hand, VCO output is divided by 321, and simultaneously the gate pulse (ⓒ) for phase comparison is generated. The detection output (ⓓ) is obtained by phase-comparing ⓑ and ⓒ at the AFC DET. This detection output is smoothed by the filter at Pin ⑩ and used to control VCO oscillation frequency.

The above process is called AFC loop or VCO PLL.

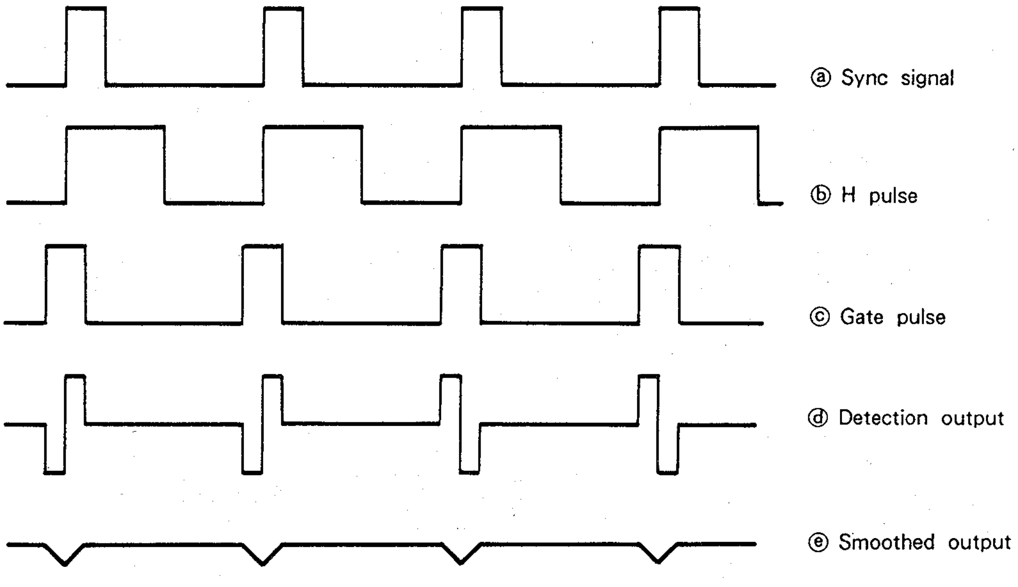


Fig. 30

③ 4-phase Shift Circuit

This circuit produces a signal whose phase is shifted 90° at 1H intervals, to be input to the remaining sub converter terminal.

[MESECAM mode]

Since the PS recording system is not used for SECAM chrominance signal processing, the 4-phase shift circuit is fixed to 0° .

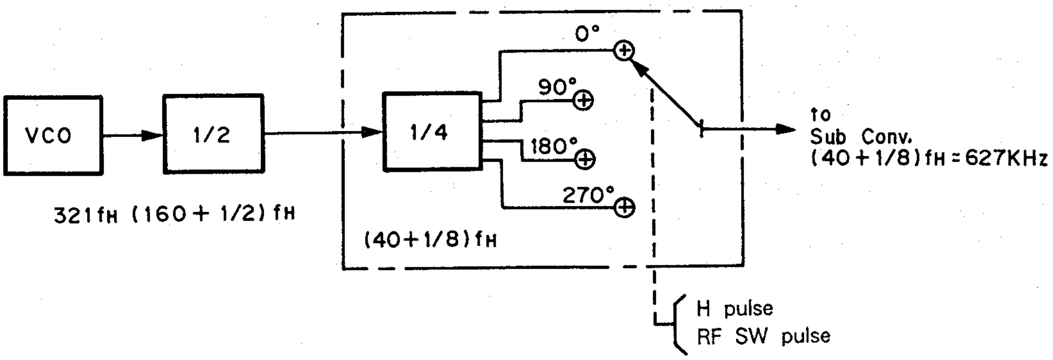

VCO
1/2
1/4
321fH (160+1/2)fH
(40+1/8)fH
0°
90°
180°
270°
to
Sub Conv.
(40+1/8)fH≒627KHz
H pulse
RF SW pulse

Fig. 31

The 4-phase shift circuit is composed of a 1/2 divider and a 1/4 divider. Four signals, 90° out-of-phase respect to each other, are obtained by 1/4 division. They are switched at 1H intervals by the H pulse generated at the AFC circuit and sent to the sub converter.

In the PAL system, phase shift is applied only to channel 2 (RF SW pulse at high level). A 90° phase delay is introduced at 1H intervals during recording, and a 90° phase advance during playback.

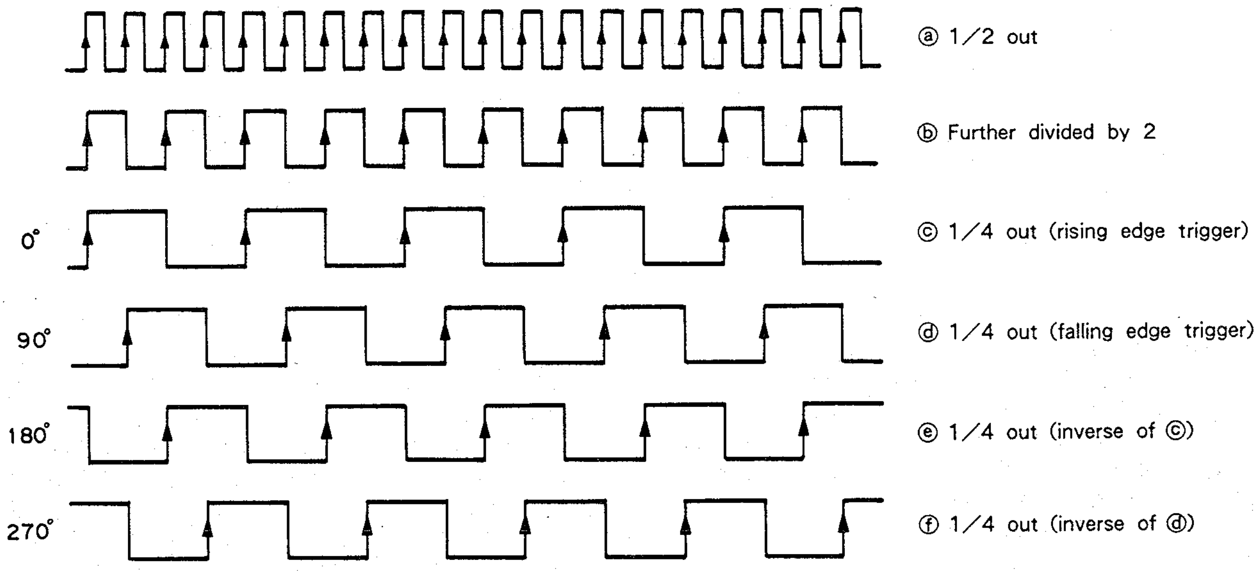

ⓐ 1/2 out
ⓑ Further divided by 2
0°
ⓒ 1/4 out (rising edge trigger)
90°
ⓓ 1/4 out (falling edge trigger)
180°
ⓔ 1/4 out (inverse of ⓒ)
270°
ⓕ 1/4 out (inverse of ⓓ)

Fig. 32

3. Frequency Interleave

At the AFC circuit, VCO oscillation frequency is controlled so that it becomes 321 times that of the horizontal sync signal. Then it is divided by 8 at the 4-phase shift circuit, becoming 40 + 1/8 times. This produces frequency interleave with the luminance signal, reducing wavering.

According to the sampling theorem, the luminance signal is spectrally distributed to an integral multiple of the horizontal sync signal frequency (15.625 kHz). Even when this luminance signal is frequency-modulated for recording, it is spectrally distributed to an integral multiple of 15.625 kHz. When recording on tape, the chroma signal converted to a low frequency is superposed to the frequency-modulated luminance signal. At this time, wavering due to interference between the luminance and chroma signals can be reduced by aiming at the valleys in the luminance signal frequency distribution pattern.

Since 4-phase shift is applied, the chroma signal is represented by four spectrums. These spectrums are distributed to (40 + n/8 : n = an odd number) times the horizontal sync signal.

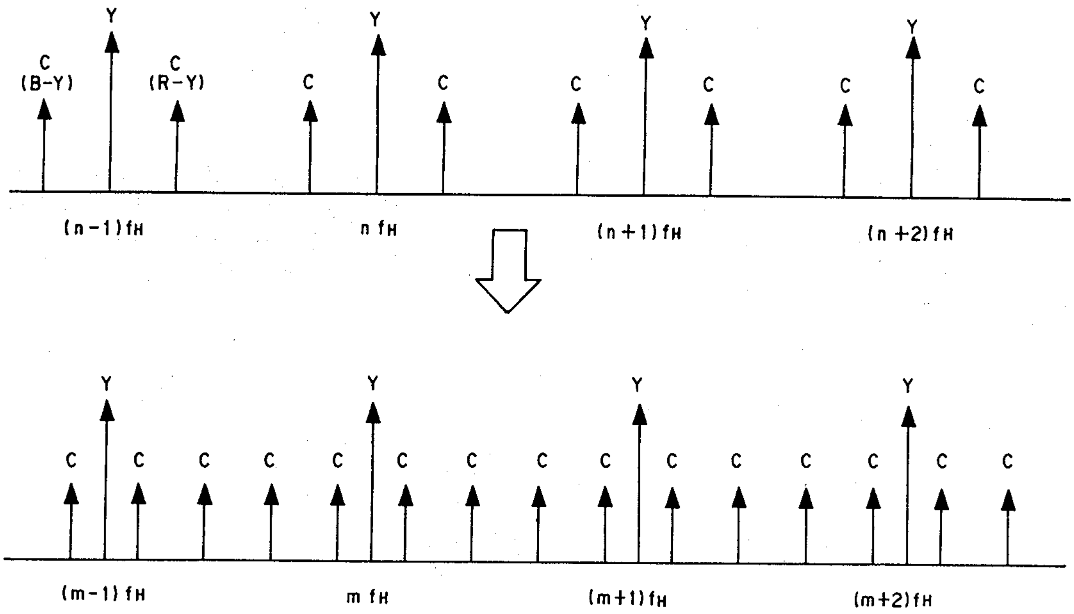


Fig. 33

4. Side Lock Prevention Circuit

At the start of picture playback or when adjacent tracks are skipped during special playback, etc., APC fails and the VCO oscillation frequency is deviated from the specification. When this deviation reaches a certain frequency, the APC loop is locked. This is called side lock or mislock.

During playback, the APC loop phase-compares the crystal oscillator output signal with the playback burst signal and feeds back the error voltage to the VCO to keep the oscillation frequency at 5.015 MHz. When side lock occurs, VCO oscillation frequency is deviated from 5.015 MHz, so frequency (and hence phase) of the frequency conversion carrier signal (5.06 MHz) input to the main converter is affected as well, resulting in unacceptable hue changes.

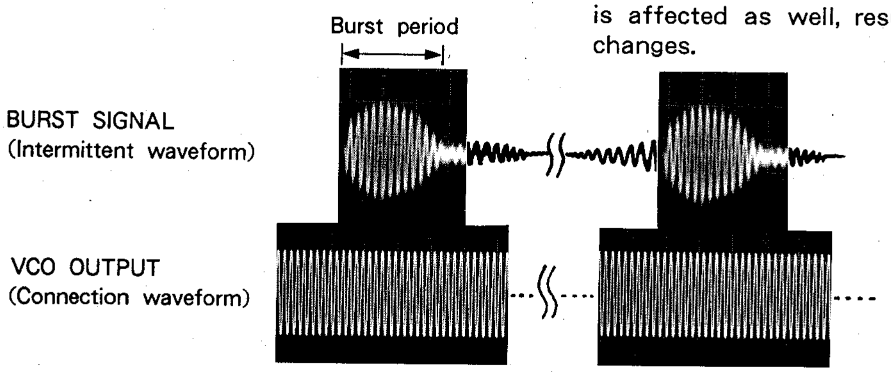


Fig. 34

Follows a simplified explanation of the side lock effect.

The APC circuit only works on the two input signals shown in the figure during burst periods. Therefore, it does not respond to frequency changes occurred while the burst gate is closed; it assumes the burst signal is continuous. In case there is a difference of exactly n cycles (n = an integer) between a burst and the next one, i.e. burst signal frequency is shifted an integral number of times from the horizontal sync signal, the APC loop appears to be locked if the signal is only observed during the burst period.

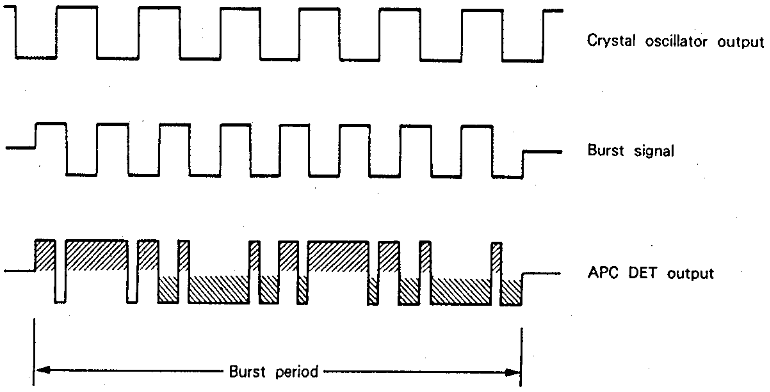


Fig. 35

As shown in Fig. 3-15, the burst signal and the crystal oscillator output are not in phase, but since high and low level periods of the APC DET output are equal the same potential of a normal lock condition is obtained by integrating while passing the signal through a filter, and VCO cannot be controlled.

The side lock condition is detected as follows.

This condition is detected by counting the APC circuit VCO oscillation frequency. This frequency is divided by 8 before being input to the sub converter. Therefore, the APC loop will be side-locked, resulting in hue distortion, even if the above oscillation frequency is shifted 8 × n times (n = an integer) the horizontal sync signal frequency (15.625 kHz).

The side lock detection circuit counts VCO cycles over a 4H period. When the number of cycles goes beyond a specified value (± 4), a compensation pulse is produced. This pulse is filtered by the capacitor (C1105) at Pin ⑧. When this capacitor is charged by the compensation pulse, the pulse is sent to the VCO control terminal through R1102. This is called the APC ID pulse.

* Values for a 4H Period in the Normal Lock Condition
  Gate period : $(1/15625) \times 4 = 0.256$ ms
  VCO frequency : $321 \times 15625 = 5015.625$ kHz
  Counts : $5015.625 \times 0.256 = 1284$

* Values for a 4H Period in the Mislock Condition (n = 1)
  VCO frequency : $321 \times 15625 + 8 \times 15625 = 5140.625$ kHz
  Counts : $5140.625 \times 0.256 = 1316$

3-5. IC MODE SWITCHING TERMINALS

1. REC/PB mode switching terminal (Pin ⑨)

Pin ⑨ is the recording chroma signal output terminal, but it is also used for recording/playback mode switching control.

Namely, the playback mode is set when a voltage of 2.1 V DC or above is applied to Pin ⑨, and the recording mode when no voltage is externally applied to it.

As shown in Fig. 36, PB 5V power is used to apply DC voltage through the Q1106 transistor for playback only, and the playback chroma signal is simultaneously input to Pin ⑦ via the LPF (XF111). During recording, since the PB 5V voltage is not applied to Pin ⑨, the chroma signal passes through the LPF (XF111), then it is sent to the recording amplifier. (The XF111 LPF is used for both recording and playback.)

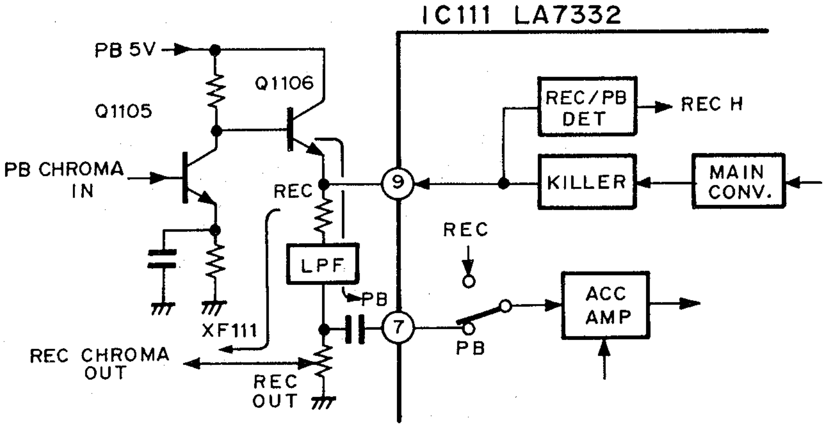

IC111 LA7332
PB 5V
Q1106
Q1105
PB CHROMA IN
REC
LPF
PB
XF111
REC CHROMA OUT
REC OUT
9
7
REC/PB DET
REC H
KILLER
MAIN CONV.
REC
PB
ACC AMP

Fig. 36

2. SP/LP mode switching (Pin ㉒)

Pin ㉒ is where the RF SW pulse is input to differentiate channels 1 and 2 during 4-phase shift (PS) in the PAL system, but it is also used for LP/SP speed switching control.

As shown in Fig. 37, two comparators are connected to Pin ㉒, allowing to recognize two control conditions as shown in Fig. 38.

SP/LP internal control is used for APC loop switching during playback.

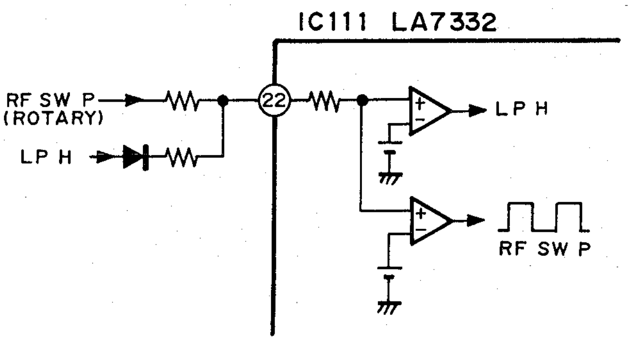

IC111 LA7332
RF SW P (ROTARY)
LP H
22
LP H
RF SW P

Fig. 37

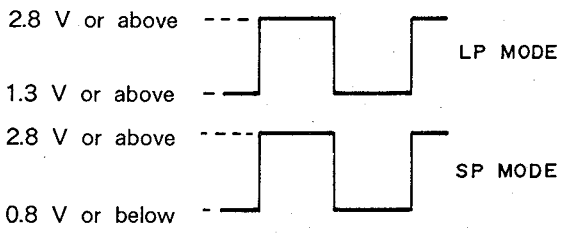


Fig. 38. Waveform at Pin ㉒

3. PAL/NTSC/MESECAM switching terminal (Pin ①)
IC111 (LA7332) can be switched among three settings for NTSC chroma signal processing, PAL chroma signal processing, and SECAM signal processing according to the MESECAM system.

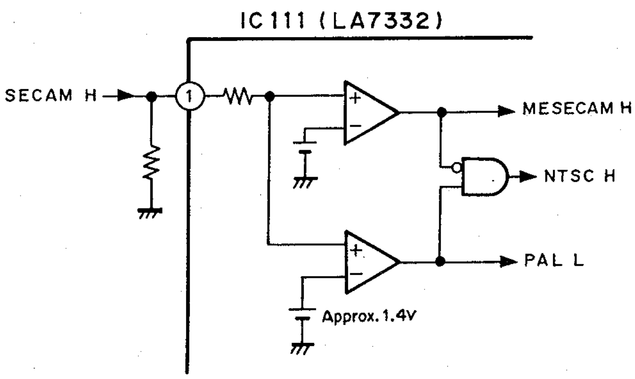


Fig. 39

As shown in Fig. 39, IC111 is composed of two comparators and a gate. The relation between the voltage applied to Pin ① and the IC internal mode is shown below (Tables 1 and 2).

Voltage applied to Pin ①	Mode
0 to 1.0V	PAL
1.7 to 3.2V	NTSC
3.9 to 5.0v	MESECAM

Table 1

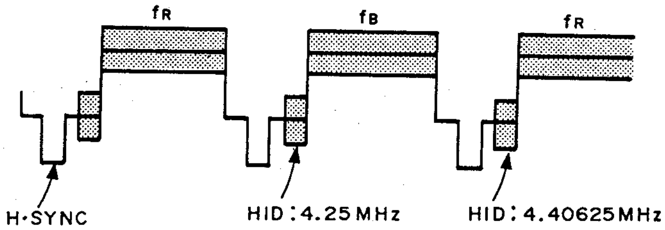
MODE		NTSC	PAL	MESECAM
NO FREQUENCY		320f_H	321f_H	321f_H
VCO CONTROL	REC	AFC	AFC	AFC
	PB	APC	APC	
VXO CONTROL	REC	APC	APC	free run
	PB	free run	free run	
PB APC LOOP	SP	after COMB	before COMB	—
	LP	after COMB	after COMB	
	EP		—	
APC KILLER ID		○	○	OFF
4 PHASE SIFT (ROTATION)	1CH (LOW)	90° advance every 1H	STOP	STOP
	2CH (HIGH)	90° delay every 1H	90° delay every 1H	
4 PHASE SIFT CLOCK	REC	H.SYNC	H.SYNC	—
	PB	DPLL	DPLL	
	⑮pin : H	H.SYNC	H.SYNC	
BURST EMPHASIS DE-EMPHASIS	SP	○	—	—
	LP	—		
	EP	○		
SLD MASK (INHIBIT)	⑮pin : H ACC KILLER	Not masked	Not masked	—
	Others	Masked for a 19H period from the SW pulse edge.		

Table 2

3-6. SECAM CHROMA SIGNAL PROCESSING

1. Characteristics of the SECAM chroma signal

In this chroma signal, two kinds of FM subcarrier (obtained by modulating the R – Y and B – Y color-difference signals respectively), are alternately superposed to the luminance signal at intervals of one horizontal scanning period.

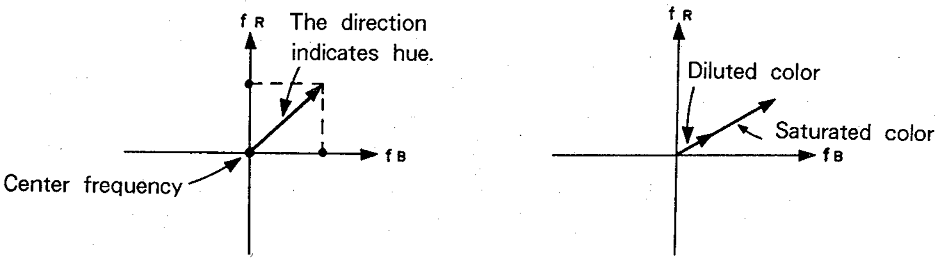

fR
fB
fR
H·SYNC
HID : 4.25 MHz
HID : 4.40625 MHz

fB : Signal obtained by frequency modulation of the B – Y signal
fR : Signal obtained by frequency modulation of the R – Y signal

Fig. 40

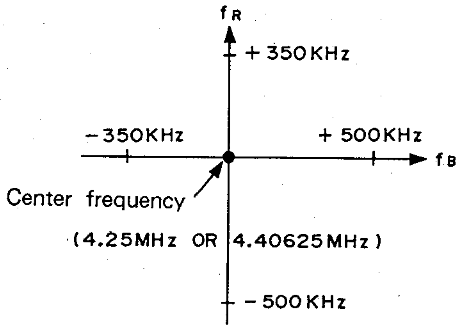
A signal called HID is included instead of the burst signal used in the PAL system. R – Y and B – Y lines are differentiated by detecting the HID frequency.
The SECAM chroma signal is totally different from NTSC and PAL signals.

In these later systems, chroma signal level indicates color saturation, while hue is given by the phase difference between the burst and chroma signals. In the SECAM system, the direction of the vector composed from fR and fB indicates hue, and frequency deviation gives colour saturation (see the figures below).


fR
The direction indicates hue.
fB
Center frequency
fR
Diluted color
Saturated color
fB

Hue

Color saturation


fR
+ 350 KHz
– 350KHz
+ 500KHz
fB
Center frequency
(4.25MHz OR 4.40625MHz)
– 500 KHz

Frequency deviation limit

Fig. 41

2. chroma signal processing method

The PAL chroma signal, obtained by amplitude modulation of a single-frequency signal, allows for crosstalk removal by 90° phase shift (PS) as explained in the previous section. The SECAM chroma signal, however, is composed of two FM signals, preventing the use of phase shifting for crosstalk removal.

The MESECAM system has been developed to permit processing of the SECAM FM chroma signal with the same circuits used for the PAL signal.

In this case, the 90° phase shift circuit is fixed to 0°, and the APC circuit (which detects and controls the phase during playback is not used. The main internal blocks of IC111 (LA7332) during MESECAM processing are shown in Fig. 42.

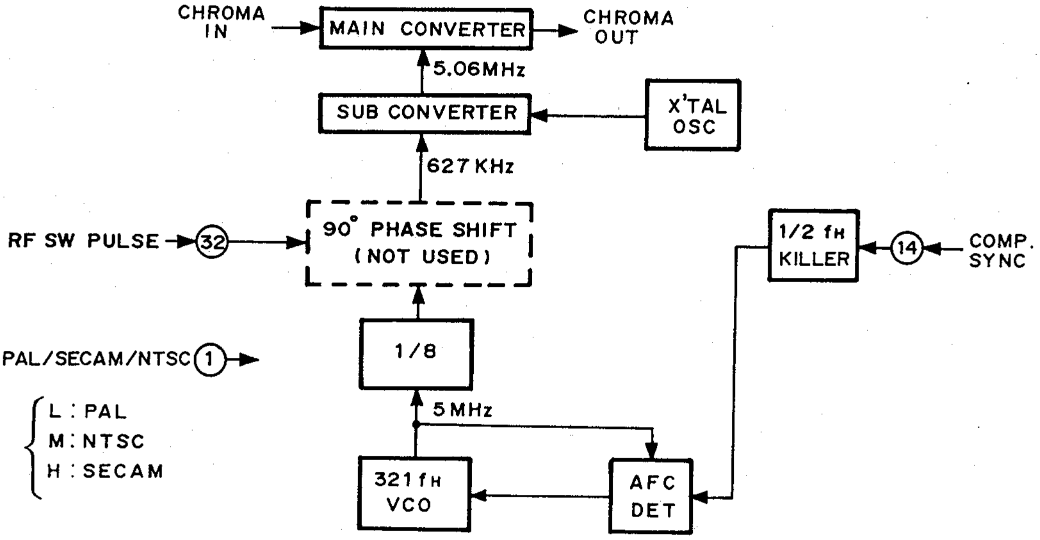
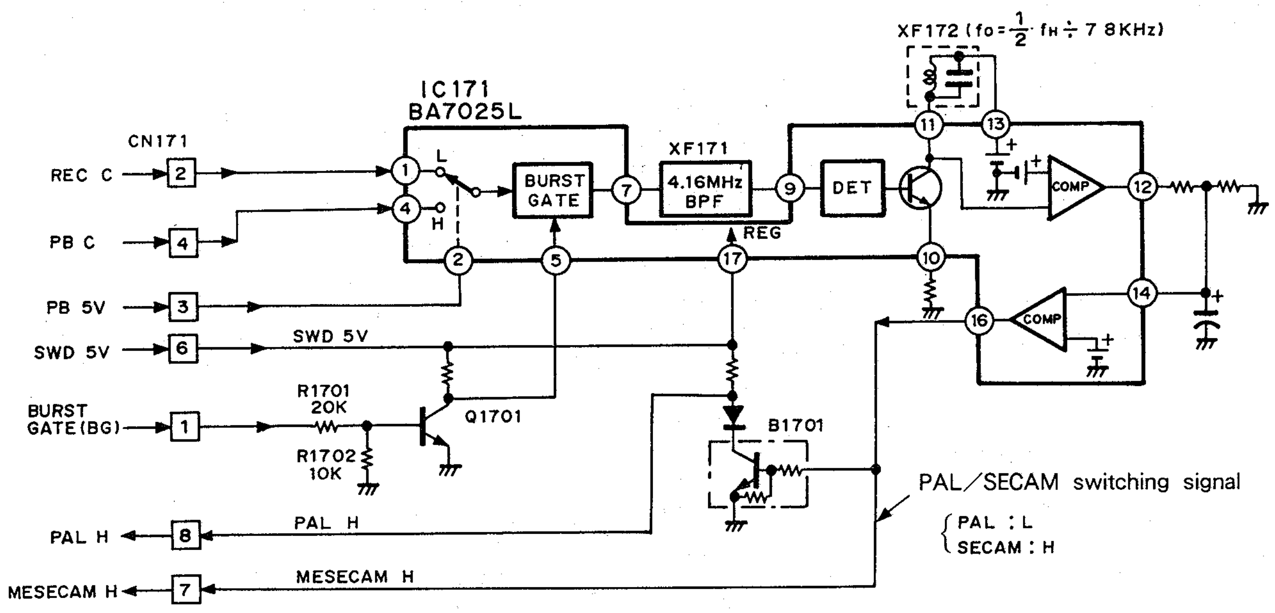

CHROMA IN
MAIN CONVERTER
CHROMA OUT
5.06MHz
SUB CONVERTER
X'TAL OSC
627KHz
RF SW PULSE
32
90° PHASE SHIFT (NOT USED)
1/2 fH KILLER
14
COMP. SYNC
PAL/SECAM/NTSC
1
L : PAL
M : NTSC
H : SECAM
1/8
5MHz
321fH VCO
AFC DET

Fig. 42

ME SECAM		
VCO FREQUENCY	REC/PB	321fH
VCO CONTROL	REC/PB	AFC
X'TAL CONTROL	REC/PB	FREE RUN
90° PHASE SHIFT (PS)	REC/PB	NOT USED (Fixed to 0°.)

3-7. PAL/SECAM Discrimination Circuit (VD-1 Board)

In PAL/SECAM compatible units, each system switching is required for the chroma signal processing IC (IC111, LA7332). A PAL/SECAM discrimination circuit is provided on the VD-1 board to automatically generate a system switching signal (PAL H/MESECAM H).



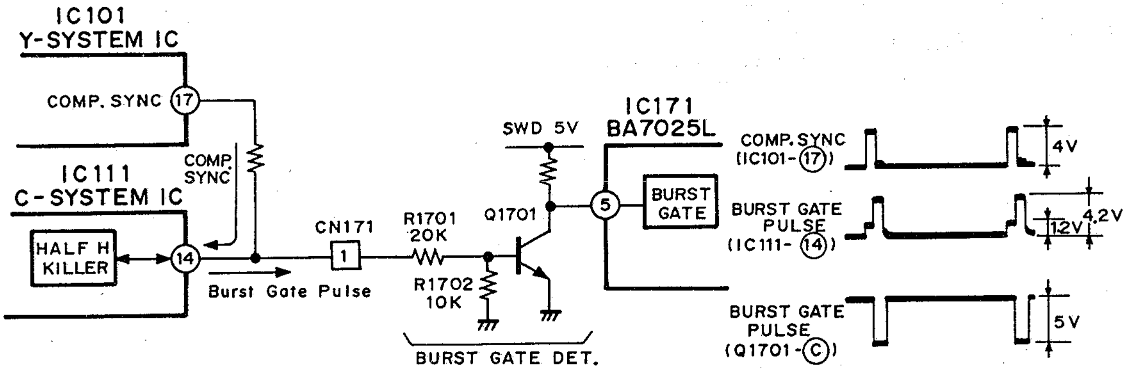
XF172 (fo=½·fH ÷ 7 8KHz)
IC171
BA7025L
CN171
REC C
PB C
PB 5V
SWD 5V
BURST GATE (BG)
PAL H
MESECAM H
L
H
BURST GATE
XF171
4.16MHz BPF
DET
REG
COMP
COMP
SWD 5V
R1701 20K
R1702 10K
Q1701
B1701
PAL H
MESECAM H
PAL/SECAM switching signal
PAL : L
SECAM : H

Fig. 43

[Operation of Q1701]

Pin ⑭ of the chroma signal processing IC (IC111, LA7332) works both as a composite sync signal input terminal and as a burst gate pulse output terminal.

Voltage at Pin ⑭ is 1.2 V when receiving the composite sync signal, and 4.2 V when the burst gate pulse is output. A detector circuit composed of R1701, R1702 and Q1701 is provided on the VD-1 board to select the burst gate pulse.



IC101
Y-SYSTEM IC
COMP. SYNC
COMP. SYNC
IC111
C-SYSTEM IC
HALF H KILLER
Burst Gate Pulse
CN171
R1701 20K
R1702 10K
Q1701
SWD 5V
IC171
BA7025L
BURST GATE
BURST GATE DET.
COMP. SYNC (IC101-⑰)
4V
BURST GATE PULSE (IC111-⑭)
1.2V
4.2V
BURST GATE PULSE (Q1701-Ⓒ)
5V

Fig. 44

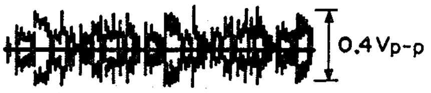
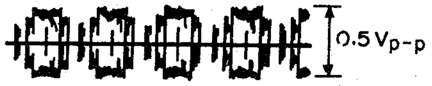
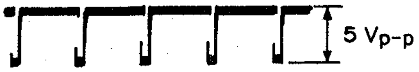
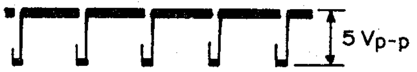
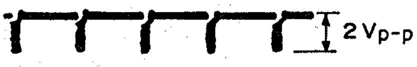
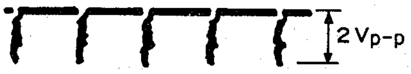
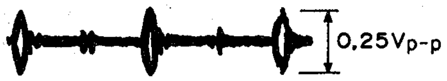
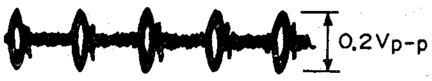
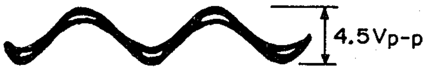
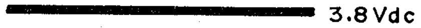
	SECAM	PAL
REC CHROMA ①pin		
BURST GATE PULSE ⑤pin		
GATED BURST ⑦pin		
TUNNED BURST ⑨pin		
1/2f_H TUNED ⑪pin		
⑫pin	4.2Vdc	0Vdc
⑭pin	4.2Vdc	0Vdc
OUTPUT ⑯pin	4.4Vdc	0.1Vdc

Fig. 45

Frequency of the PAL burst signal is always 4.43 MHz, but the SECAM HID signal changes between 4.25 MHz and 4.4025 MHz at 1H intervals.

IC171 differentiates between the PAL and SECAM signals by determining whether the 4.25 MHz signal is present or not.

The burst (PAL) or HID (SECAM) signal is extracted from the chroma signal input to Pin ① or ④ by the burst gate pulse input to Pin ⑤.

The extracted signal passes through a 4.16 MHz BPF and is detected. If it is a SECAM signal, an output signal as shown in Fig. 45 is obtained by means of the tuning circuit connected to Pin ⑪. This signal is then compared to the reference voltage at the comparator, and Pin ⑯ outputs a high level.

5. AUDIO CIRCUIT

[Circuit constructions]

The audio system circuit consists of following boards.

- CP-1 board, AD-A circuit ;
  Audio input/output selector, noise reduction (PNR) circuit, and audio FM modulator/demodulator circuits are incorporated inside the Hi-Fi audio main IC (IC231).
- AD-1 board, normal audio circuit ;
  The normal audio circuit performs the processes with conventional IC201 (LA7294).
- PRE-AMP unit ;
  Hi-Fi audio head (AF) recording/playback amplifier circuit
- The audio level meter circuit and audio mode indicator are mounted on the TM-1 board on the front.

The Hi-Fi audio circuit consists of IC231 (different for normal audio) only. Furthermore, the 20 kHz low-pass filter, and 1.4 MHz/1.8 MHz bandpass filter, etc. which were conventionally applied as external circuits have been incorporated. However, the basic signal processing system does not differ from conventional one even though the Hi-Fi audio circuit has become one IC.

1. OUTLINE OF VHS Hi-Fi SYSTEM

1-1. OUTLINE OF VHS Hi-Fi SYSTEM

In VHS Hi-Fi recording system, 2 channels of audio signal are converted into 2-frequency of FM signals and previously recorded by rotary audio head. After that, the rotary video head records the video signal. The arrangement relation of the video head (V) and the audio head (AF) is shown in Fig. 1.

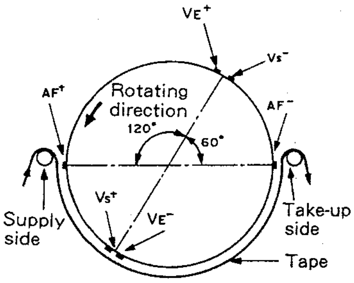


Fig. 1. Construction of Rotary Head

The VHS Hi-Fi adopts the multiple recording method that deeply records the audio signal within the tape magnetic layer and superficially records the video signal by setting the audio head (AF) to the rotating cylinder and advancing at 120° against the video head.

The tape cross section diagram at audio and video signal recording is shown in Fig. 2.

The magnetic layer of the video tape has a thickness of 4 µm. Audio signals are recorded to a depth of 2.5 µm from the surface of the tape. Video signals are recorded in pile to a depth of 1.3 µm subsequently.

By adjusting the azimuth angle of the audio head by ± 30° (± 6° on the video head), the head is protected from crosstalk from adjacent tracks and being mixed with the video signal.

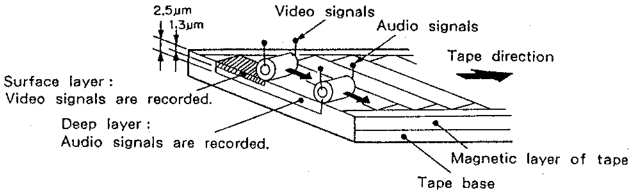


Fig. 2. Tape Cross-section in the Recording of Audio and video Signals

The frequency spectrum of video and audio signals are shown in Fig. 3.

The audio (Hi-Fi) signal is recorded after FM modulating following two carrier signals positioned between the luminance signal (Y) and color signal (C) (both signals are called video signal).

f1 : 1.4 MHz ± 10 kHz (Lch)
f2 : 1.8 MHz ± 10 kHz (Rch)

As the audio head is independent, there is no need to change the video signal spectrum, and Y and C signals are included together in the extended sideband spectrum as shown in Fig. 3. Therefore, there is no deterioration on picture quality by the influence of audio signals.

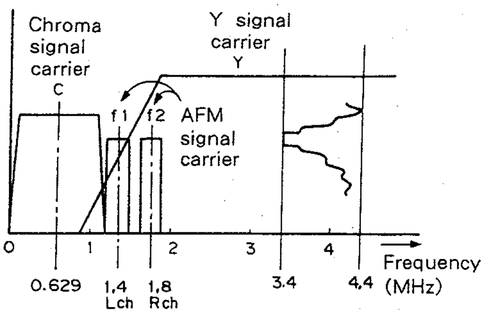


Fig. 3. Recording Signal Spectrum

2. VHS Hi-Fi SPECIFICATIONS

The specifications of VHS Hi-Fi system are shown in table 1.

Item	Specification
Recording system	2-frequency FM recording
Center carrier frequency	method [a : 1.4 MHz ± 10 kHz]
Maximum	[b : 1.8 MHz ± 10 kHz]
deviation	± 150 kHz ± 50 kHz Compressed ratio : 2 : 1
Operating deviation	
Noise reduction	logarithmic Detection method : Peak

Table 1. VHS Hi-Fi specification

3. AUDIO INPUT/OUTPUT SIGNAL SELECTOR

Fig. 4 shows the input selector block and the input/output signals of the one chip Hi-Fi IC (IC231), and Fig. 5 shows the output selector block and the input/output signals respectively.

3-1. INPUT SIGNAL SELECTOR BLOCK

The input signal is selected with the internal switch by the DC voltage applied to each control pin, such as Pins ①, (77) and (79).

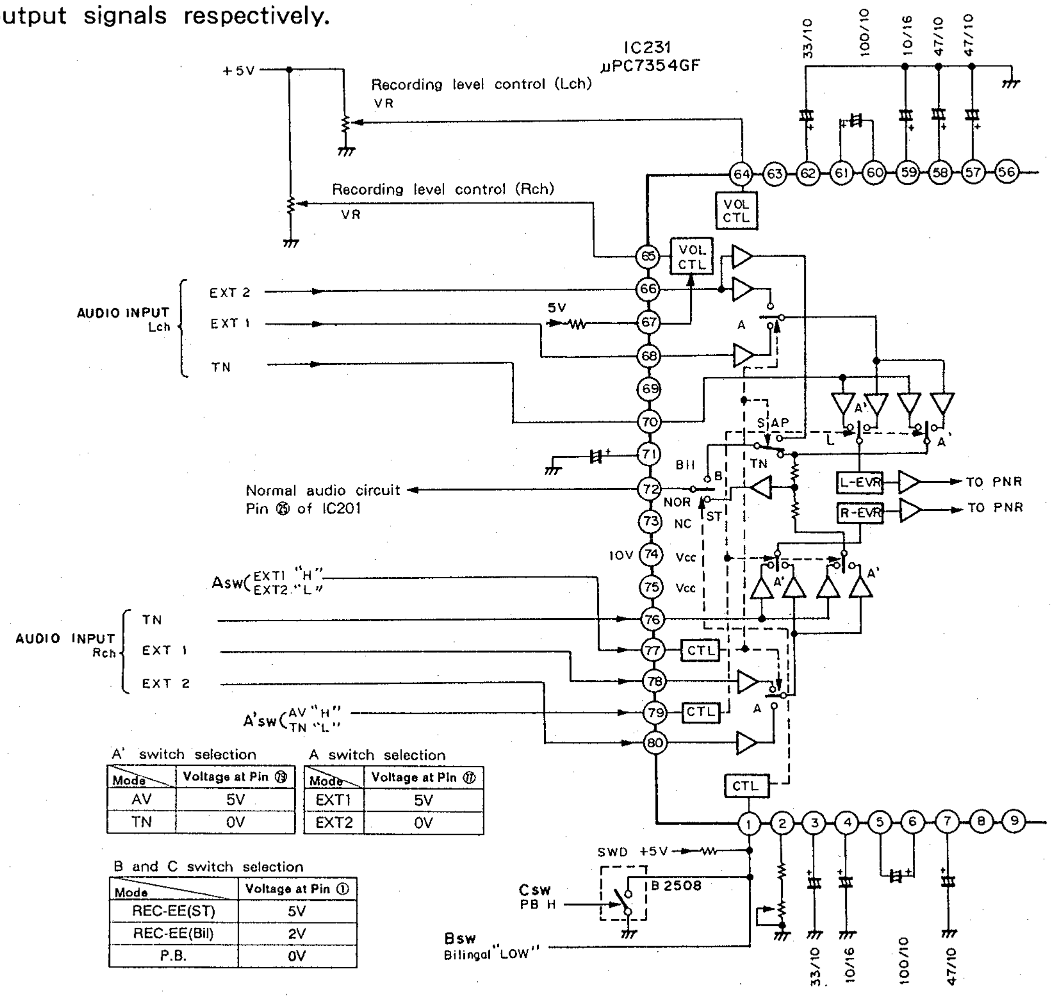
Each switch function inside the IC is shown below:

A, A' switch...(Tuner, EXT1, EXT2) Selection of audio input.

B switch...(MONO (L + R), TUNER (Lch)) Selection of normal audio circuit.

C switch...(REC, PB) Mode switching selection.

* In IC231, the recording level can be varied by the DC voltage at Pins (64) and (65). When the mode select pin of Pin (67) is connected to ground, the potentiometer on the side of Pin (65) is functioned as L/R balance control.


IC231
μPC7354GF
+5V
Recording level control (Lch)
VR
Recording level control (Rch)
VR
33/10
100/10
10/16
47/10
47/10
64
63
62
61
60
59
58
57
56
VOL CTL
VOL CTL
65
66
67
68
69
70
71
72
73
74
75
76
77
78
79
80
AUDIO INPUT Lch
EXT 2
EXT 1
TN
5V
A
SAP
L
A'
Bil
B
TN
NOR
ST
NC
Normal audio circuit
Pin ㉕ of IC201
10V
Vcc
Vcc
L-EVR
R-EVR
TO PNR
TO PNR
Asw(EXT1 "H", EXT2 "L")
AUDIO INPUT Rch
TN
EXT 1
EXT 2
A'sw(AV "H", TN "L")
CTL
CTL
CTL
1
2
3
4
5
6
7
8
9
SWD +5V
Csw
PB H
B 2508
Bsw
Bilingal "LOW"
33/10
10/16
100/10
47/10

A' switch selection

Mode	Voltage at Pin (79)
AV	5V
TN	0V

A switch selection

Mode	Voltage at Pin (77)
EXT1	5V
EXT2	0V

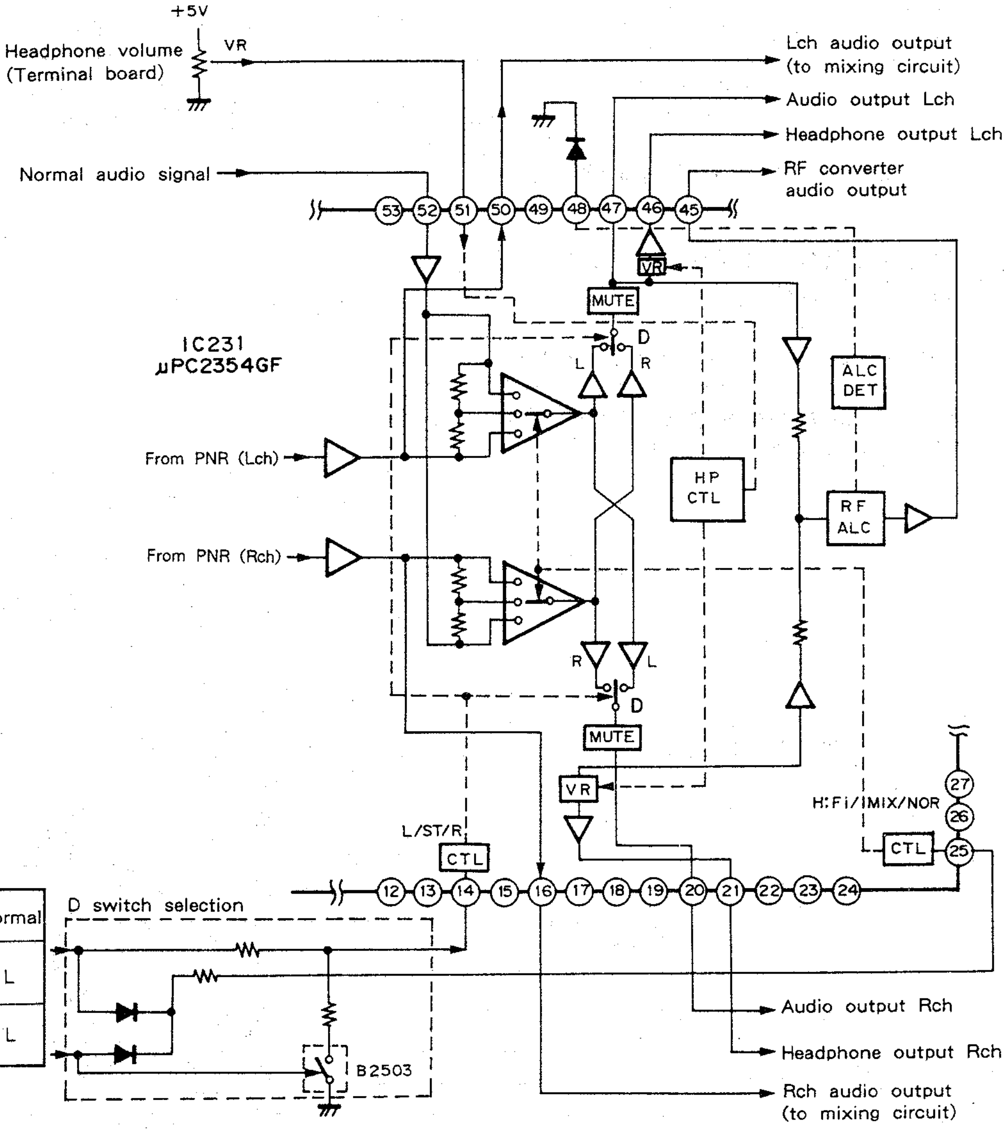
B and C switch selection

Mode	Voltage at Pin ①
REC-EE(ST)	5V
REC-EE(Bil)	2V
P.B.	0V

Fig. 4. Input Signal Selector Block

3-2. OUTPUT SIGNAL SELECTOR BLOCK

The output signal is selected with the internal switch by the DC voltage applied to each control pins, such as Pins ⑭ and ㉕.
Each switch function inside the IC is shown below:
D switch...(STEREO, L, R, NORMAL) Output selection of stereo, L channel, R channel and Normal.
In IC231, the electronic potentiometer (volume control) for the headphone and RF audio output circuit is incorporated.
The electronic potentiometer for the headphone is selected by the control voltage at Pins ⑭ and ㉕, output level is controlled by the DC voltage (0 to 5V) at Pin (51), and is output from Pins ㉑ and ㊻.


+5V
Headphone volume
(Terminal board)
VR
Normal audio signal
Lch audio output
(to mixing circuit)
Audio output Lch
Headphone output Lch
RF converter
audio output
53
52
51
50
49
48
47
46
45
VR
MUTE
D
L
R
IC231
µPC2354GF
ALC
DET
From PNR (Lch)
HP
CTL
RF
ALC
From PNR (Rch)
R
L
D
MUTE
VR
H:Fi/MIX/NOR
27
26
25
L/ST/R
CTL
CTL
12
13
14
15
16
17
18
19
20
21
22
23
24
D switch selection
Audio output Rch
Headphone output Rch
B2503
Rch audio output
(to mixing circuit)

Mode / Input	ST	L	R	Normal
AD SEL 0	H	H	H	L
AD SEL 1	H	L	H	L

Mode	Voltage at Pin ⑭	Pin ㊼ output	Pin ⑳ output
L-ch	5V	L	L
STEREO	2V	L	R
R-ch	0V	R	R

Mode	Voltage at Pin ㉑
Hi-Fi	5V
Normal	0V

Fig. 5. Output Signal Selector Block

4. NOISE REDUCTION (PNR) CIRCUIT

A construction of the noise reduction circuit for the Hi-Fi audio is shown in Fig. 6.

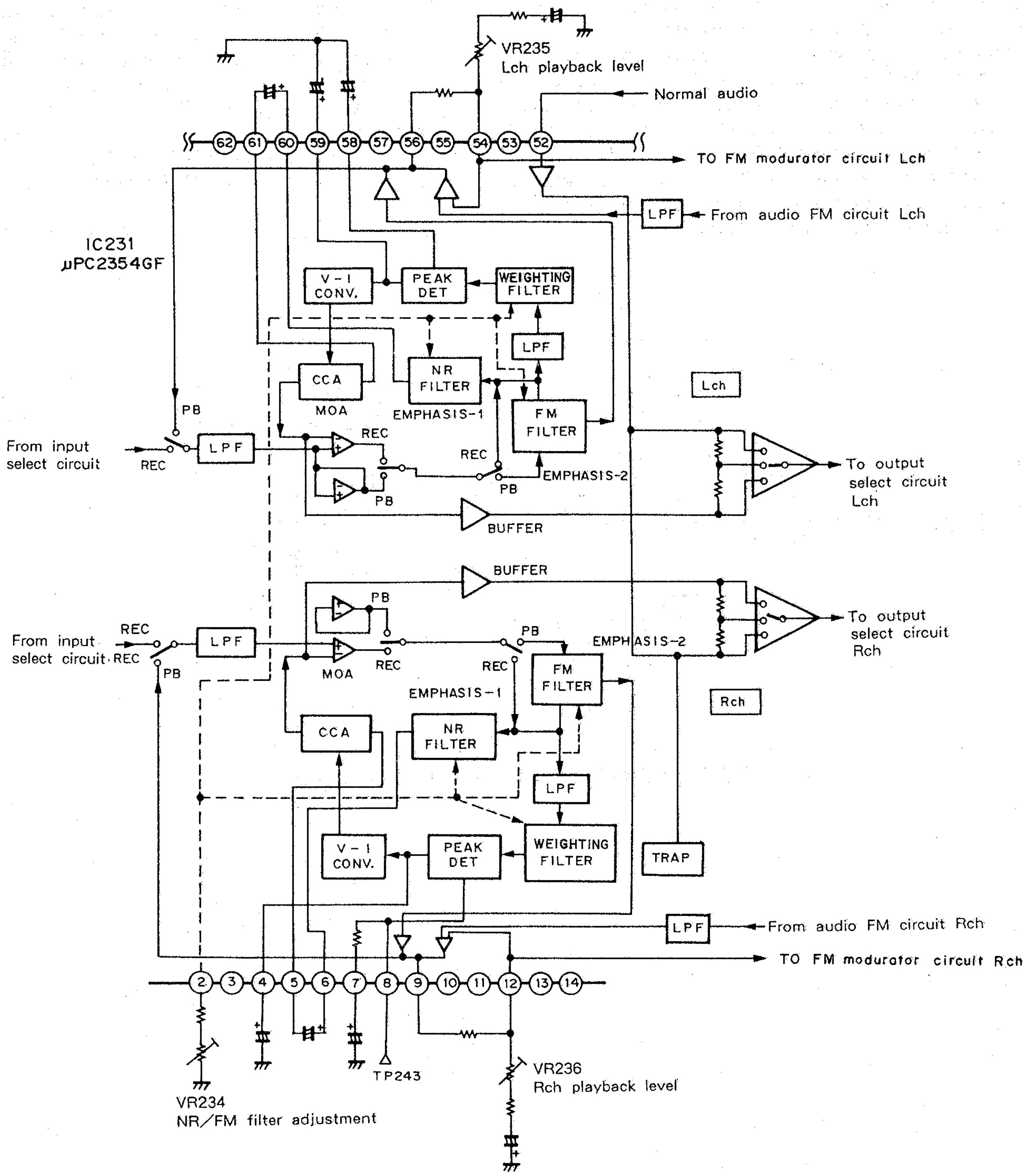

VR235
Lch playback level
Normal audio
62
61
60
59
58
57
56
55
54
53
52
TO FM modurator circuit Lch
LPF
From audio FM circuit Lch
IC231
μPC2354GF
V-I CONV.
PEAK DET
WEIGHTING FILTER
LPF
CCA
NR FILTER
MOA
EMPHASIS-1
FM FILTER
Lch
PB
From input select circuit
REC
LPF
REC
REC
PB
PB
EMPHASIS-2
To output select circuit Lch
BUFFER
BUFFER
PB
To output select circuit Rch
REC
From input select circuit
REC
PB
LPF
MOA
REC
PB
EMPHASIS-2
REC
FM FILTER
EMPHASIS-1
Rch
CCA
NR FILTER
LPF
V-I CONV.
PEAK DET
WEIGHTING FILTER
TRAP
LPF
From audio FM circuit Rch
TO FM modurator circuit Rch
2
3
4
5
6
7
8
9
10
11
12
13
14
TP243
VR236
Rch playback level
VR234
NR/FM filter adjustment

Fig. 6. Noise Reduction (PNR) Circuit

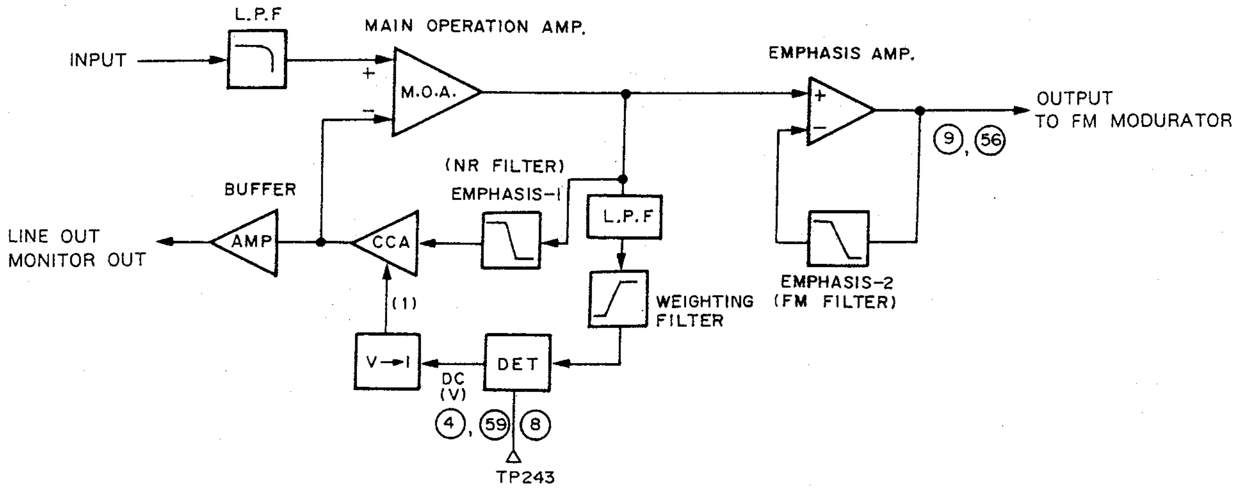
4-1. PNR CIRCUIT IN RECORD MODE

Since frequency modulation (FM) system is used for Hi-Fi audio recording, a triangular noise is generated at demodulating the signal and that cause the deterioration of S/N ratio. In general, an emphasis is used to reduce this triangular noise. However, this only is not enough to reduce the noise. In this FM recording method, there is almost no change in the playback audio output level even when the playback carrier level is changed. Therefore, in the noise reduction (NR) system, a large level compression is carried out and perform recording. This is called PNR (Peak Noise Reduction) which combines the emphasis functions in the low frequencies, and the circuit which compresses the change in audio input signal level into half.

Fig. 7 shows the NR circuit construction in the recording mode.

a) Low-pass filter (LPF)...Inside IC231.
b) Main operational amplifier (MOA)
   PNR processor which consists a negative feedback loop in the MOA. This PNR processor consists of emphasis amplifier, weighting filter, CCA control signal detector (DET), voltage/current converter (V/I), and current control amplifier (CCA).
c) Emphasis amplifier (EMPHASIS-2)
d) Audio monitor (LINE OUT) buffer amplifier

○ shows the pin numbers of NR IC (IC231).



L.P.F
MAIN OPERATION AMP.
INPUT
+
−
M.O.A.
EMPHASIS AMP.
+
−
OUTPUT TO FM MODURATOR
⑨, (56)
(NR FILTER) EMPHASIS-I
BUFFER
LINE OUT MONITOR OUT
AMP
CCA
L.P.F
WEIGHTING FILTER
EMPHASIS-2 (FM FILTER)
(I)
V→I
DET
DC (V)
④, (59) ⑧
TP243

Fig. 7. PNR circuit in the recording mode (Rch)

a) Low-pass filter

The audio signal is first input to the low-pass filter where the audio band-width (below 20kHz) signal is extracted in order to prevent malfunction of the PNR circuit from unwanted lower noise component.

b) Main operational amplifier (MOA) and PNR processor

The audio signal is input to the MOA and PNR processor through the low-pass filter. The output from the MOA is input to the emphasis-1 (NR filter) and the weighting filter. The output from the emphasis-1 is directly input to the current control amplifier (CCA) having inverse pre - emphasis characteristics.

On the other hand, the signal passed through the weighting filter, DET circuit and V/I converter is used as an amplifier gain control signal for the CCA. The weighting filter works to control the amplifier gain of the CCA with sensitive audio band-width. In the CCA, when the level of audio input signal is large, the level of control signal detected by the DET circuit is large , therefore, the CCA gain also becomes large. When the level of audio input signal is small, the level of control signal becomes small, therefore, the CCA becomes small.

In order to apply negative feedback to the signal output from the CCA to MOA, high frequency area of the emphasis-1's reverse characteristics is increased, and at the same time, high level signal portion is compressed (logarithm 1/2) and extracted as MOA output.

As described above, the overall function of the PNR processor is to compress the audio signal, and at the same time, create an emphasis characteristics in reference to the auditory good higher level of the frequency band-width against the complex frequency components of audio signals (music, etc.). In other words, it has a variable emphasis characteristics in accordance with the audio frequency and the audio level.

c) Emphasis amplifier (EMPHASIS-2:FM FILTER)

This unit apply the following two emphases :

One is an emphasis-1 (NR Filter) of the PNR circuit which has a variable emphasis characteristics correspond to the audio frequency and the audio level. The other is an emphasis-2 (FM Filter) which mainly works to eliminate the triangle noise.

Since the emphasis-2 of the negative feedback circuit is reverse pre-emphasis characteristics, this is negatively fed back and obtains a pre-emphasis characteristics type amplifier with boosting the high frequency area.

Audio recording signal is input to the frequency modulator after passing and processing the noise reduction (PNR) and emphasis circuits.

d) Buffer amplifier for the audio monitor (LINE OUT)

The audio signal for recording and EE monitoring are extracted from the CCA output of the PNR circuit. The frequency characteristics of this audio signal is identical in plus (+) input of the MOA. Therefore, signal can be used as audio monitor signal just by passing through the buffer amplifier. The output from this buffer is sent to the internal output signal selector.

4-2. PNR CIRCUIT IN PLAYBACK MODE

The NR circuit in the playback mode is different from the negative feedback loop in the recording mode, it becomes an open loop construction, as shown in Fig. 8.

Selection of recording or playback is done by the switch inside the IC. Since the main circuit shown below is used for both recording and playback, the matching of various characteristics is superior.

○ shows the pin numbers of NR IC (IC231).

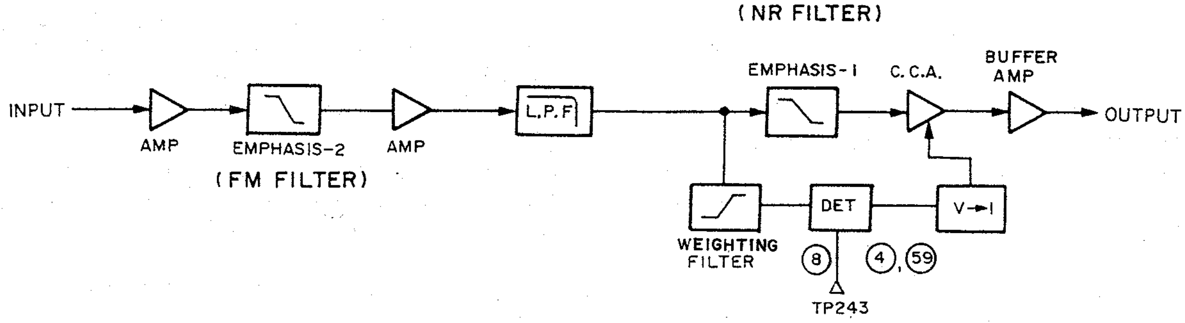


Fig. 8 PNR circuit in playback mode (Rch)

a) Emphasis (EMPHASIS-2 FM filter)
This is a fixed emphasis to reduce the triangular noise. In the playback mode, since it becomes an open loop, it operates as a de-emphasis (reduction of high frequencies).

b) Low pass filter (L.P.F.)
This eliminates other than the audio band-width (maximum 20 kHz), and prevents the PNR processor from mis-operations. At the same time, it has a function to reduce the distortion of the hold waveforms when there are switching noise and dropout noise.

c) P.N.R. processor
(Emphasis circuit (EMPHASIS-1 NR filter), current control amplifier (C.C.A.), weighting circuit (weighting filter), C.C.A. control signal detection (DET), voltage/current conversion (V-I))
In the recording mode, in order to return the audio signal compressed logarithmically by 1/2 to normal, it cuts the negative feedback loop with the M.O.A., and operates in an open loop. Therefore, in the C.C.A. output, signals of small input levels become smaller, and signals of large input levels become larger, and it becomes the original audio signals expanded logarithmically by 2. By combining the CCA operation and the characteristics of EMPHASIS-1, a same demodulating signal as the audio input signal in the recording mode can be obtained.
In this way, the demodulating audio signal that has been signal processed is sent to the audio output selector via the buffer amplifier.

4-3. ADJUSTMENT OF THE EMPHASIS FILTER

In the PNR circuit, there are the NR-filter (EMPHASIS-1), the weighting filter, and the FM-filter (EMPHASIS-2). By varying the time constant of Pin ② with VR234, the three kinds of filter frequency characteristics are simultaneously adjusted.

5. AUDIO FM (A-FM) MODULATION/ DEMODULATION CIRCUIT

Fig. 9 shows the internal block and respective signals of the FM modulation and demodulation circuits of the 1 chip IC (IC231) for Hi-Fi.

5-1. FREQUENCY MODULATION (FM) CIRCUIT (RECORDING SYSTEM)

The audio signal processed through the P.N.R. as explained before, is input to the FM circuit; Rch: Pin ⑫ (1.8 MHz), Lch: Pin (54) (1.4 MHz) respectively. A voltage control oscillator (V.C.O.) which is superior in its linearity is used in the frequency modulator (FM). The frequency deviation of the modulator takes the improvement effect of the S/N into consideration, and is set at a maximum of ± 150 kHz. This frequency deviation (modulation level) is adjusted by performing the playback level adjustment (VR235-Lch, VR236-Rch) when playing back, and there is no need for adjustment. Also, the carrier frequency of the modulator is adjusted with VR251 (Lch) and VR252 (Rch) respectively.

5-2. DEMODULATION CIRCUIT (PLAYBACK SYSTEM)

The playback head amplifier output signal of the pre-amplifier unit is input to Pin ㉝ of IC231, and the separation of the Lch and Rch carriers is done in the B.P.F. within the IC. The Lch passes through the 1.4 MHz B.P.F., and the Rch passes through the 1.8 MHz B.P.F., and when they are separated respectively, is input to the demodulation circuit of Lch and Rch respectively.

This demodulation circuit uses the voltage control oscillator (VCO) used as a modulator when recording, and constructs a phase locked loop (PLL) system demodulator. The time constant of Pin ㉚ is varied with VR239, the frequency characteristics of the 1.4 MHz/1.8 MHz B.P.F. are simultaneously adjusted.

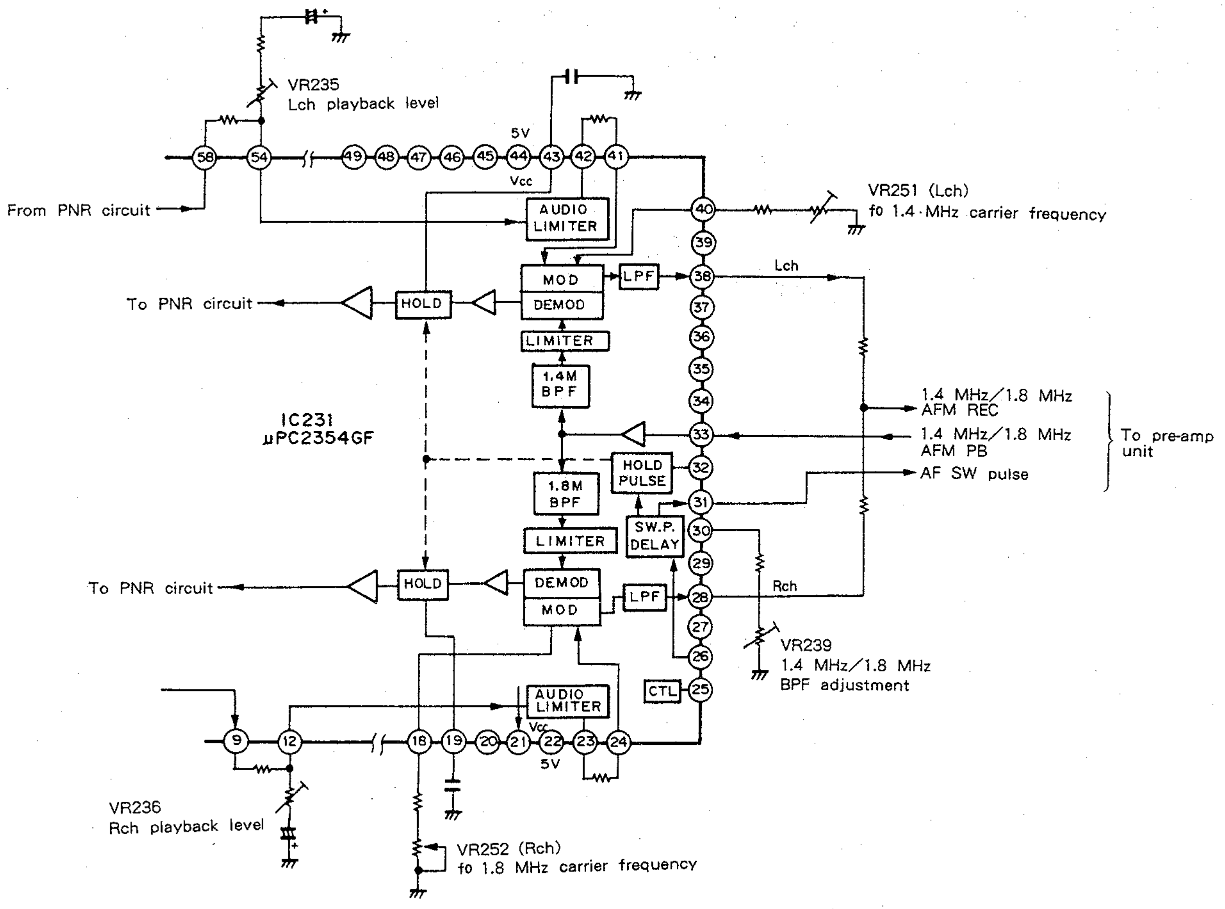

VR235
Lch playback level
5V
Vcc
58
54
49
48
47
46
45
44
43
42
41
From PNR circuit
AUDIO LIMITER
VR251 (Lch)
f0 1.4 MHz carrier frequency
40
39
Lch
MOD
DEMOD
LPF
38
To PNR circuit
HOLD
LIMITER
37
36
1.4M BPF
35
34
IC231
μPC2354GF
33
HOLD PULSE
32
1.8M BPF
31
LIMITER
SW.P. DELAY
30
29
1.4 MHz/1.8 MHz AFM REC
1.4 MHz/1.8 MHz AFM PB
AF SW pulse
To pre-amp unit
To PNR circuit
HOLD
DEMOD
MOD
LPF
28
Rch
27
26
VR239
1.4 MHz/1.8 MHz BPF adjustment
AUDIO LIMITER
CTL
25
Vcc
9
12
18
19
20
21
22
23
24
5V
VR236
Rch playback level
VR252 (Rch)
f0 1.8 MHz carrier frequency

Fig. 9. Audio FM Circuit

6. AUDIO FM SIGNAL RECORDING/ PLAYBACK AMPLIFIER
(IC1 pre-amplifier unit)

The A-FM recording/playback amplifier consists of an IC1. (Refer to Fig. 10)

6-1. RECORDING AMPLIFIER

The signal mixed 1.4 MHz and 1.8 MHz by AD-A is input to Pin ⑧ of IC1, and the amplified signal is supplied from Pin ㉒ to the AF⁺/AF⁻ heads.
At this time, the output from Pin ㉒ is controlled by the recording amplifier ON/OFF (H when ON) signal of Pin ⑦.

6-2. PLAYBACK AMPLIFIER

This circuit consists of an IC1 which incorporates a pre-amplifier (cascode amplifier), switching circuit. The pre-amplifier amplifies minute signals obtained from the AF⁺/AF⁻ rotary heads. Also, by the AF head switching pulse which is delayed by 60 ° compared to the RF switching pulse created in the servo circuit, the AF⁺/AF⁻ signals are switched respectively, and become a continuous signals that can be demodulated.
In this way, the amplified signal is output to the demodulation circuit.

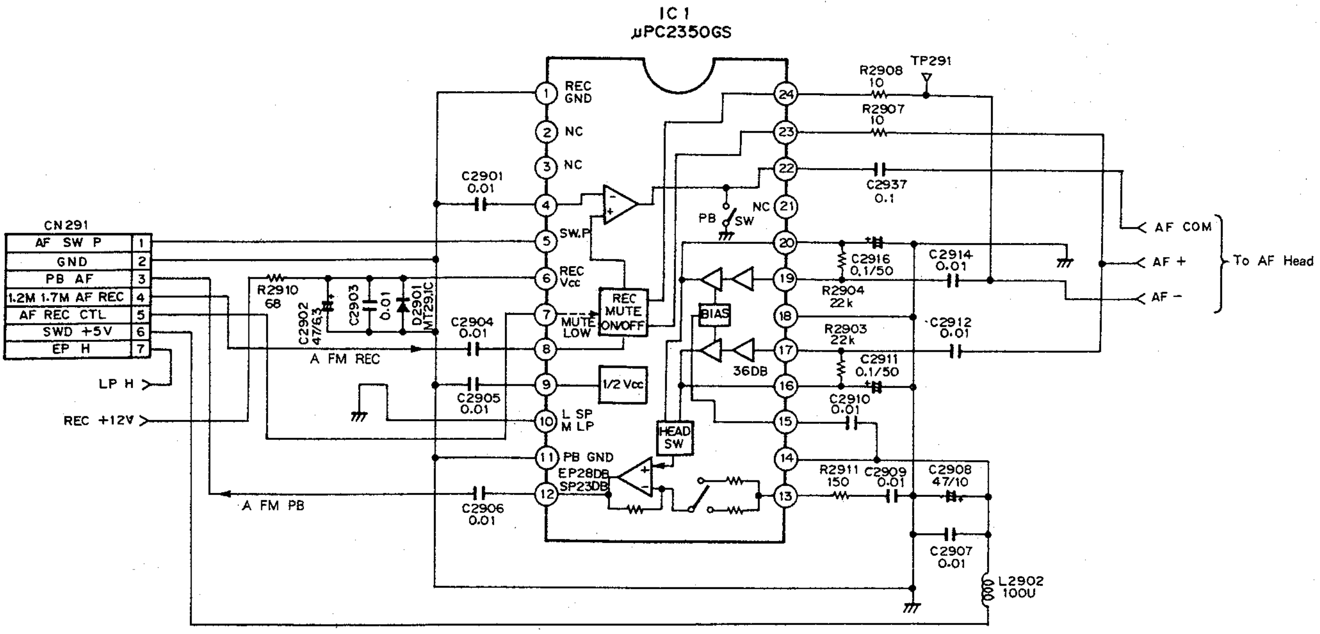

IC 1
µPC2350GS
CN291
AF SW P 1
GND 2
PB AF 3
1.2M 1.7M AF REC 4
AF REC CTL 5
SWD +5V 6
EP H 7
LP H
REC +12V
R2910
68
C2902
47/6.3
C2903
0.01
D2901
MT29.1C
A FM REC
A FM PB
C2901
0.01
C2904
0.01
C2905
0.01
C2906
0.01
1 REC GND
2 NC
3 NC
4
5 SW.P
6 REC Vcc
7 MUTE LOW
8
9
10 L SP M LP
11 PB GND
12 EP28DB SP23DB
REC MUTE ON/OFF
1/2 Vcc
BIAS
HEAD SW
36DB
PB SW
NC 21
24
23
22
20
19
18
17
16
15
14
13
R2908
10
TP291
R2907
10
C2937
0.1
C2916
0.1/50
R2904
22k
C2914
0.01
C2912
0.01
R2903
22k
C2911
0.1/50
C2910
0.01
R2911
150
C2909
0.01
C2908
47/10
C2907
0.01
L2902
100U
AF COM
AF +
AF −
To AF Head

Fig. 10.

7. HOLD CIRCUIT

The FM audio carrier of the Hi-Fi VTR is recorded /played back by the use of the rotary head. Hence, when playing back, a continuous signal is extracted by switching over between the AF⁺/AF⁻ heads at every half rotation of the head. However, in a few μsec period of the switching, a discontinuous carrier section is included. When this is demodulated, a noise is generated. This is called as "head switching noise".

Also, when the magnetic surface of the tape is ruptured, the carrier discontinuous section in the ruptured period is included, and a noise is generated. This is called the "dropout noise".

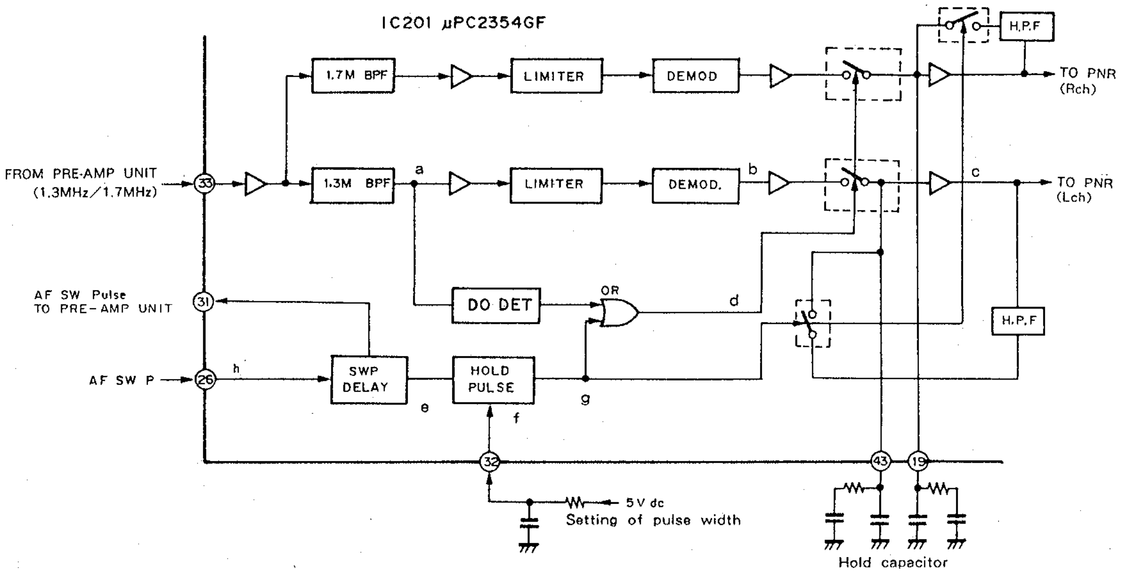
In order to reduce the switching noise and dropout noise, this hold circuit carries "sampling hold" of either the signal level immediately before the head switchover, or that immediately before the dropout until the end of the discontinuous section of the FM audio carrier.

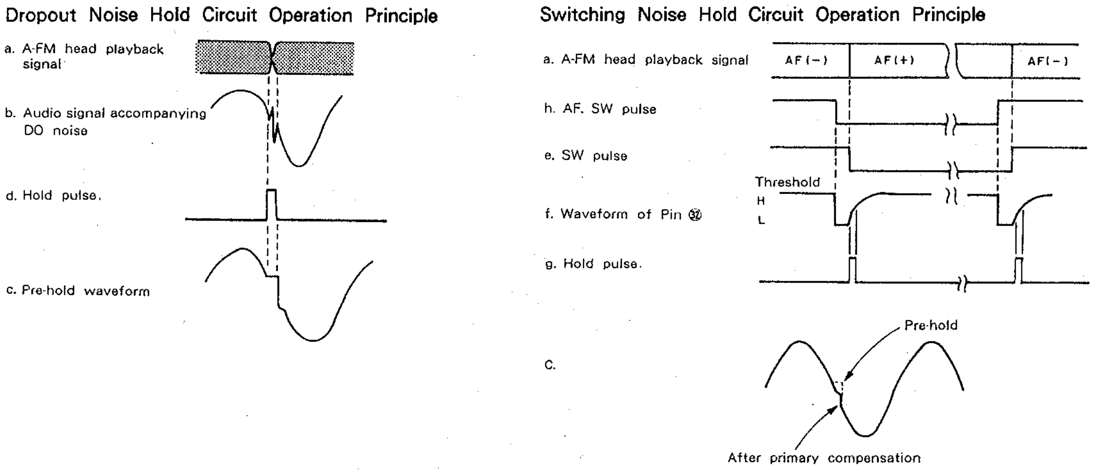
The hold circuit of this system reduces the noise in the dropout noise hold and switching circuit incorporated in the 1 chip IC231 explained above. (shown in Fig. 11)

[Dropout and switching noise hold circuit operation]

In the dropout noise, when the A-FM playback signal of the 1.4 MHz (Lch) side is detected, and the approx. 18 dB level becomes below the reference level, the DO detection circuit starts to operate and the hold pulse is output, and the noise is pre-held. At this time, the switch on the HPF side becomes OFF state.

In the switching noise, the hold pulse is output from the hold pulse circuit by the time constant of Pin ㉜ of IC231 by AF-SWP, and it reduces the noise by performing primary compensation the switching section.


IC201 μPC2354GF
1.7M BPF
LIMITER
DEMOD
H.P.F
TO PNR (Rch)
FROM PRE-AMP UNIT (1.3MHz/1.7MHz)
㉝
1.3M BPF
a
LIMITER
DEMOD.
b
c
TO PNR (Lch)
AF SW Pulse TO PRE-AMP UNIT
㉛
DO DET
OR
d
H.P.F
AF SW P
㉖
h
SWP DELAY
e
HOLD PULSE
f
g
㉜
㊸
⑲
5 V dc
Setting of pulse width
Hold capacitor


Dropout Noise Hold Circuit Operation Principle

Switching Noise Hold Circuit Operation Principle
a. A-FM head playback signal
b. Audio signal accompanying DO noise
d. Hold pulse.
c. Pre-hold waveform
a. A-FM head playback signal
AF(−)
AF(+)
AF(−)
h. AF. SW pulse
e. SW pulse
Threshold
H
L
f. Waveform of Pin ㉜
g. Hold pulse.
c.
Pre-hold
After primary compensation

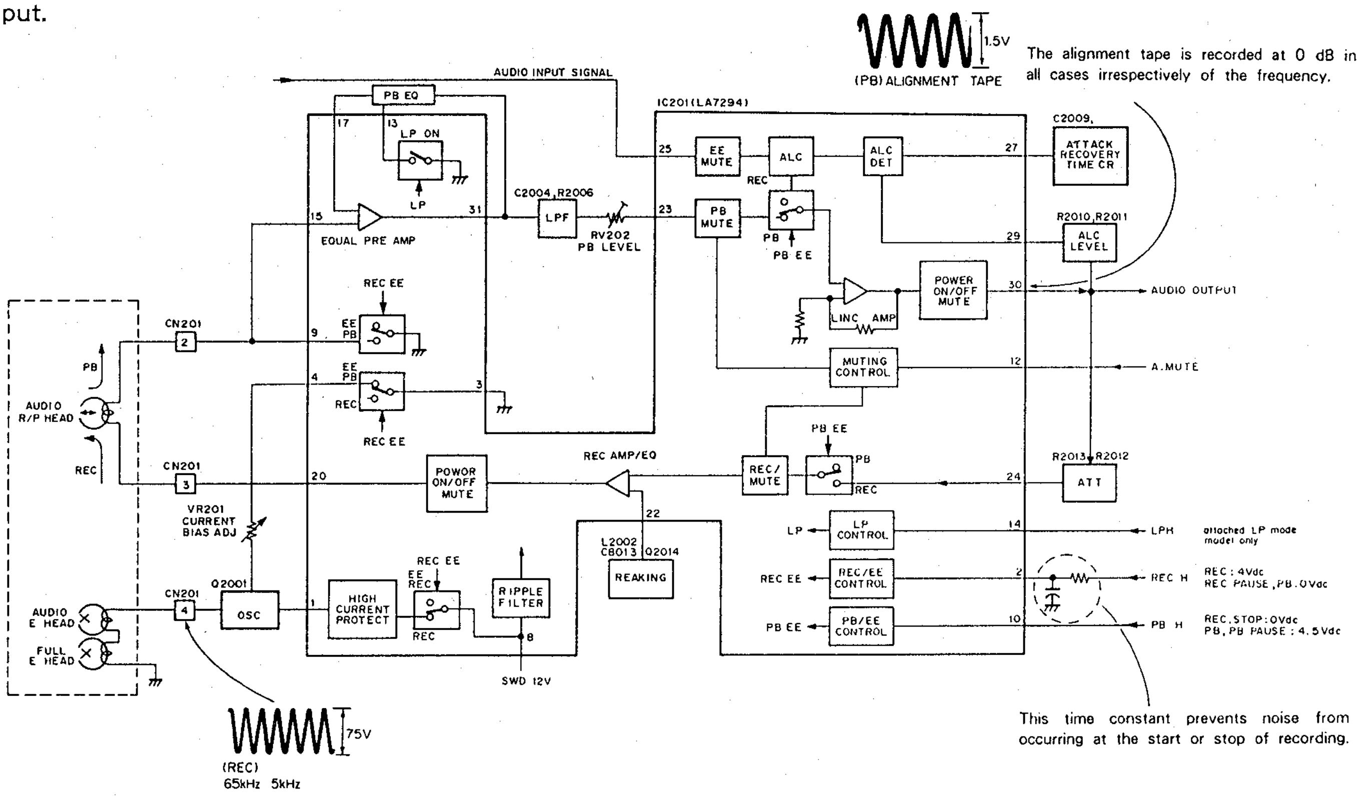
Fig. 11. Hold Circuit inside IC201

8. NORMAL AUDIO CIRCUIT BASIC PARTS

8-1. BLOCK DIAGRAM

[Input signal]

The signal is selected within the Hi-Fi audio circuit and is then input. There are some models in which the signal is mixed with the MIC input signal and input.


1.5V
(PB) ALIGNMENT TAPE
AUDIO INPUT SIGNAL
PB EQ
IC201 (LA7294)
17
13
LP ON
LP
15
EQUAL PRE AMP
31
C2004, R2006
LPF
RV202
PB LEVEL
REC EE
CN201
2
9
EE
PB
PB
AUDIO
R/P HEAD
REC
4
EE
PB
REC
3
REC EE
CN201
3
20
POWOR
ON/OFF
MUTE
REC AMP/EQ
VR201
CURRENT
BIAS ADJ
CN201
4
Q2001
OSC
1
HIGH
CURRENT
PROTECT
REC EE
EE
REC
REC
RIPPLE
FILTER
8
SWD 12V
L2002
C8013
Q2014
REAKING
22
AUDIO
E HEAD
FULL
E HEAD
75V
(REC)
65kHz 5kHz
25
EE
MUTE
ALC
ALC
DET
27
C2009,
ATTACK
RECOVERY
TIME CR
REC
23
PB
MUTE
PB
PB EE
29
R2010, R2011
ALC
LEVEL
LINC AMP
POWER
ON/OFF
MUTE
30
AUDIO OUTPUT
MUTING
CONTROL
12
A.MUTE
PB EE
REC/
MUTE
PB
REC
24
R2013, R2012
ATT
LP
LP
CONTROL
14
LPH
attached LP mode
model only
REC EE
REC/EE
CONTROL
2
REC H
REC : 4Vdc
REC PAUSE, PB. 0Vdc
PB EE
PB/EE
CONTROL
10
PB H
REC, STOP : 0Vdc
PB, PB PAUSE : 4.5Vdc

The alignment tape is recorded at 0 dB in all cases irrespectively of the frequency.

This time constant prevents noise from occurring at the start or stop of recording.

Fig. 12.

[REC Mode]

A signal from the tuner and that from the line are selected by the input switching circuit and fed to Pin 25 of IC201. The signals fed to Pin 25 are passed through the REC/PB switch and the line amplifier and then output to Pin 30. One of these signal becomes an EE output, and the other is fed to Pin 24 as a REC signal, passed through the REC amplifier, and then output to Pin 20. Now, the audio bias signal is added, and supplied from Pin 3 of CN201 to the audio head.

[PB Mode]

The signal picked up by the audio head is fed to Pin 15, and the frequency characteristic is adjusted by the equalizing amplifier for output to Pin 21. This signal is level controlled by VR202 and fed to Pin 23. It is then passed trough the line amplifier and output to Pin 30 as a playback signal.

8-2. REC SYSTEM

[REC EQ]

This unit operates only in the SP mode. No characteristic switchover is made for that reason. (Pin 26 and Pin 28 are not used.)
The frequency near 11 kHz is emphasized at approx. 10 dB.

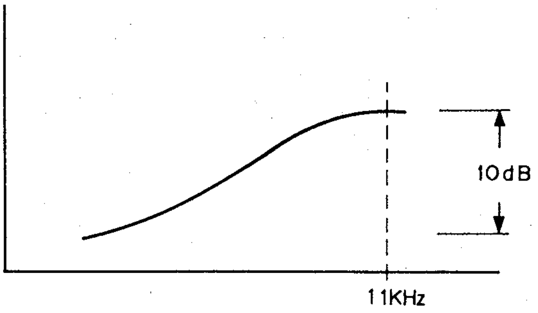


Fig. 13.

[REC Mute]

The control is made by the audio mute signal at Pin 12 input.

8-3. PLAYBACK SYSTEM

[PB EQ]

The characteristic switchover can be made according to the tape speed (SP or LP), but Pin 13 is not used in this unit since it operates only in the SP mode.

[PB Mute]

The control is made by the audio mute signal at Pin 12 input.

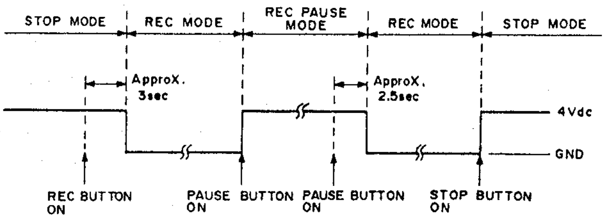
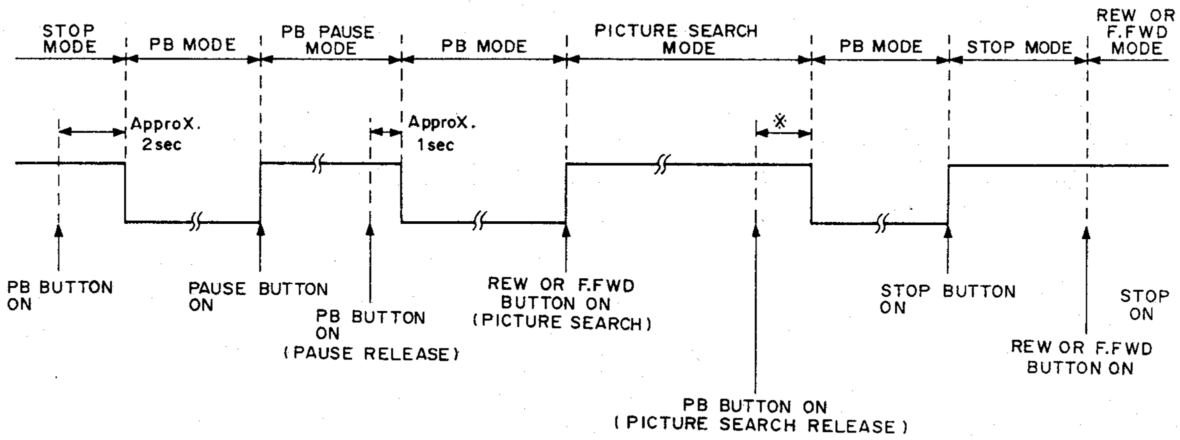

STOP MODE
REC MODE
REC PAUSE MODE
REC MODE
STOP MODE
ApproX. 3sec
ApproX. 2.5sec
4Vdc
GND
REC BUTTON ON
PAUSE BUTTON ON
PAUSE BUTTON ON
STOP BUTTON ON

Fig. 14.


STOP MODE
PB MODE
PB PAUSE MODE
PB MODE
PICTURE SEARCH MODE
PB MODE
STOP MODE
REW OR F.FWD MODE
ApproX. 2sec
ApproX. 1sec
※
PB BUTTON ON
PAUSE BUTTON ON
PB BUTTON ON (PAUSE RELEASE)
REW OR F.FWD BUTTON ON (PICTURE SEARCH)
PB BUTTON ON (PICTURE SEARCH RELEASE)
STOP BUTTON ON
REW OR F.FWD BUTTON ON
STOP ON

※ FWD SEARCH —— PB : ApproX.1sec
RVS SEARCH —— PB : ApproX.2sec

Fig. 15.

8-4. AUDIO IC TERMINAL FUNCTIONS

IC201 (LA7294) Terminal Description

Pin No.	Description of Function
1	Outputs the power for bias oscillator circuit during recording.
2	REC control terminal. H : REC, L : PB/PB PAUSE
3	GND
4	Connected to GND during EE/PB.
5	Ripple filter terminal connected with the power supply.
6	Ripple filter terminal connected with the capacitor for filter.
7	Changes the resonance frequency with the head by connecting the LP switch and capacitor. Not used because this unit operates only in the SP mode.
8	Power supply.
9	Head switch connected to GND during REC.
10	PB control terminal. H : PB/PB PAUSE, L : REC
11	Changes the resonance frequency with the head by connecting the EP switch and capacitor. Not used because this unit operates only in the SP mode.
12	For mute control during REC/PB. Muting is done at above 3.3 Vdc.
13	LP/EP switch. This terminal reduces the amount of feedback of the PB EQ AMP and increases the gain of a high band frequency. Not used because this unit operates only in the SP mode.
14	For EP control. It causes the internal switches to be turned ON at Pins 11, 13, and 28 at above 3 Vdc. Not used because this unit operates only in the SP mode.
15	Inputs a playback signal from the head.
16	GND
17	Applies negative feedback from the EQ AMP output (Pin 21) to provide EQ characteristics.
18	For LP control. It causes the internal switches to be turned ON at Pin 7, 13, and 26. Not used because this unit operates only in the SP mode.
19	GND
20	REC AMP output.
21	EQ AMP output.
22	Performs peaking of high-band frequency needed for characteristics by connecting capacitor and
23	resistor between the GND. PB signal input.
24	REC signal input.
25	Line AMP input.
26	LP switch. It changes the high-band peaking frequency during LP REC.
27	Connects a CR filter between the ALC filter and the GND.
28	EP switch. It changes the high-band peaking frequency during EP REC.
29	ALC detector input. It inputs a line AMP output signal to Pin 30.
30	Line AMP output.

Table 1

6. TUNER IF AND MULTIPLEX DECODER CIRCUIT (WEST GERMAN)

1. OVERVIEW OF EUROPEAN (WEST GERMAN) SOUND MULTIPLEX BROADCAST

European (West German) sound multiplex broadcast has adopted a system which allows reception of monophonic broadcasting, stereophonic broadcasting, and bilingual broadcasting while maintaining compatibility to existing TV receivers, practicality and dissemination of multiplex signal.

As shown in Fig. 1, the 1st sound carrier (IF-5.5 MHz) for stereo broadcasting which is the existing sound carrier, transmits L + R/2 sound and contains the information for the left and right channels. During bilingual broadcasting, the main channel sound signal is sent, maintaining compatibility with existing TV receivers.

On the other hand, during stereo broadcasting using newly provided 2nd sound carrier (IF-5.74 MHz), only the right channel is sent. Also during bilingual broadcasting, sub-channel sound is transmitted. With two separate carriers, obtaining a superior separation between the main and sub channels.

With these two different sound carriers, stereo sound, bilingual, and monophonic sound are sent, but it is necessary to identify these transmission modes. A pilot tone signal is provided on the 2nd carrier as a mode discrimination signal.

The pilot-tone signal (discrimination signal) is made of 54.6 kHz (3.5 × fH) pilot carrier AM modulated by the tone signal respectively as follows.

Stereo : 117.5 Hz (1/133fH)
Bilingual : 274.1Hz (1/57fH)
Mono : no tone signal

The pilot-tone signal is to FM modulate the 2nd sound carrier together with the 2nd sound signal. When the broadcast signals are received, detections of L + R/2 sound signal of the 1st sound carrier, R-ch sound signal of 2nd sound carrier, and the pilot tone signal is performed. The transmission mode is identified from the pilot tone signal, matrixing of the 1st and 2nd sound signals is performed, and the R-ch/L-ch audio signals are output.

FREQUENCY SPECTRUM (IF-FREQUENCY)

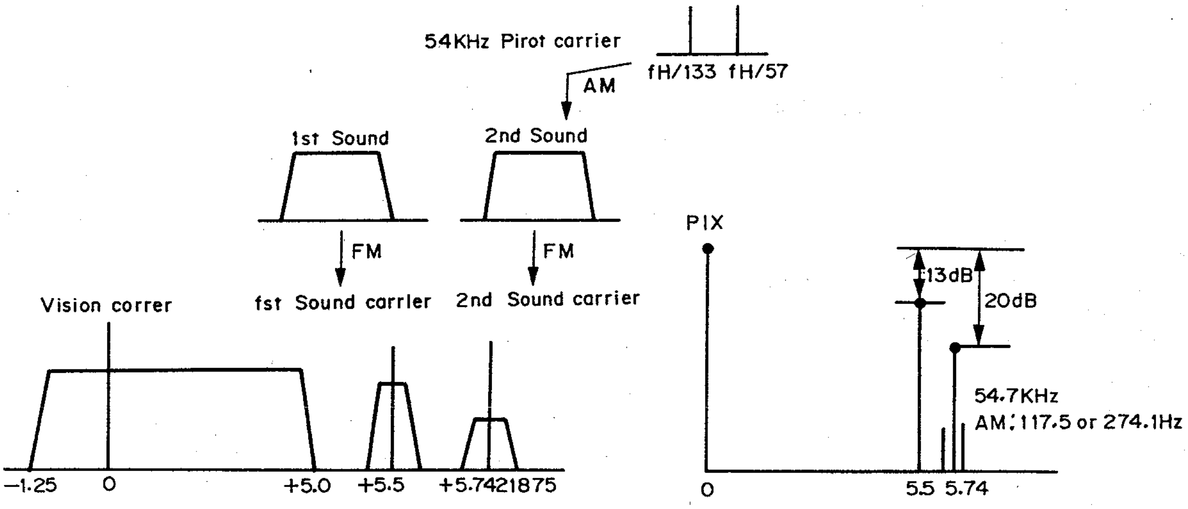


Fig. 1.

2. VIF AND SIF CIRCUIT

The IF output signal from the tuner is input to the SAW filter X6101. This signal passes through the transformer L6110 that performs impedance matching for the SAW filter and IC611, and it is then input to pins 8 and 9 of IC611.

The signal input to the IC passes through the IF amplifier and the video detection and video amplifier circuits and is output from pin 3 as a composite video signal.

The audio IF signal is input to pin 11 through Q6101, and X6102. It passes through the SIF detector circuit and is output from pin 15. The first sound carrier (5.5 MHz) signal from pin 15 is input to pin 13 through Q6103 and X6108 it passes through the limiter amplifier and the FM detector circuit, and it is then output from pin 19. The second sound carrier (5.742 MHz) signal from pin 15 is supplied to pins 7 and 8 of IC612 through X6110.

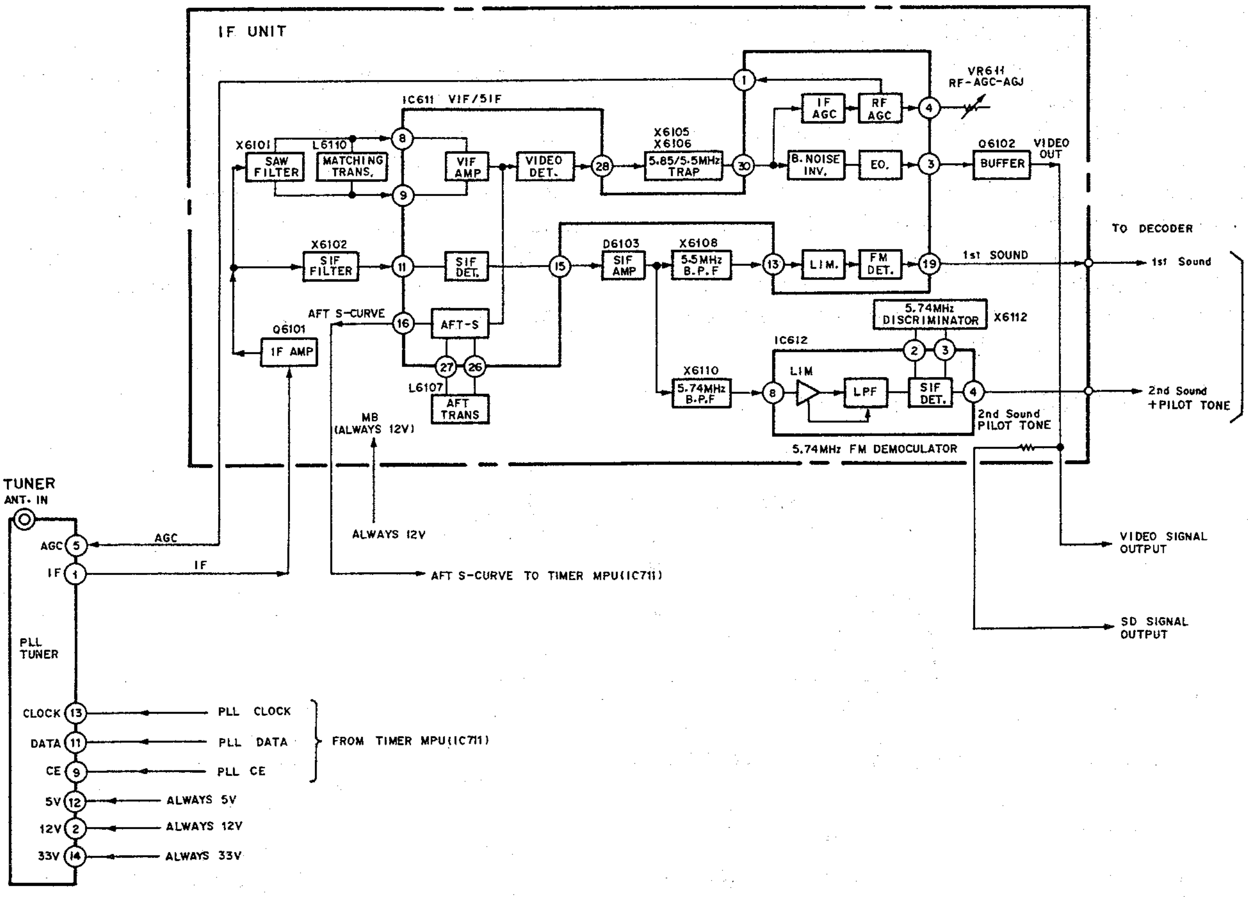

IF UNIT
IC611 VIF/SIF
X6101
SAW FILTER
L6110
MATCHING TRANS.
VIF AMP
VIDEO DET.
X6105
X6106
5.85/5.5MHz TRAP
IF AGC
RF AGC
VR611
RF-AGC-AGJ
B.NOISE INV.
EQ.
Q6102
BUFFER
VIDEO OUT
X6102
SIF FILTER
SIF DET.
D6103
SIF AMP
X6108
5.5MHz B.P.F
LIM.
FM DET.
1st SOUND
TO DECODER
1st Sound
AFT S-CURVE
Q6101
IF AMP
AFT-S
L6107
AFT TRANS
MB
(ALWAYS 12V)
5.74MHz DISCRIMINATOR
X6112
IC612
X6110
5.74MHz B.P.F
LIM
LPF
SIF DET.
2nd Sound PILOT TONE
5.74MHz FM DEMOCULATOR
2nd Sound +PILOT TONE
TUNER
ANT. IN
AGC
IF
PLL TUNER
CLOCK
DATA
CE
5V
12V
33V
ALWAYS 12V
AFT S-CURVE TO TIMER MPU(IC711)
VIDEO SIGNAL OUTPUT
SD SIGNAL OUTPUT
PLL CLOCK
PLL DATA
PLL CE
FROM TIMER MPU(IC711)
ALWAYS 5V
ALWAYS 12V
ALWAYS 33V
1
2
3
4
5
8
9
11
12
13
14
15
16
19
26
27
28
30

Fig. 2.

3. DECODER CIRCUIT

The first audio signal (MONO 1 or (L+R) ⁄2) output to pin 19 of IC611 is input to pin 25 of STEREO DECODER/MATRIX IC (IC631).

The second sound carrier (5.742 MHz) signal is input to pin 8 of IC612, it passes through the limiter amplifier and the SIF detector circuit, and it is output from pin 4 of IC612. This second audio signal (MONO 2 or R) is input to pin 27 of STEREO DECODER/MATRIX IC (IC631).

The pilot tone signal output to pin 4 of IC612 passes through the C6307 and is also applied to pin 2 of IC631, it passes the decoder circuit.

Stereo broadcasts:

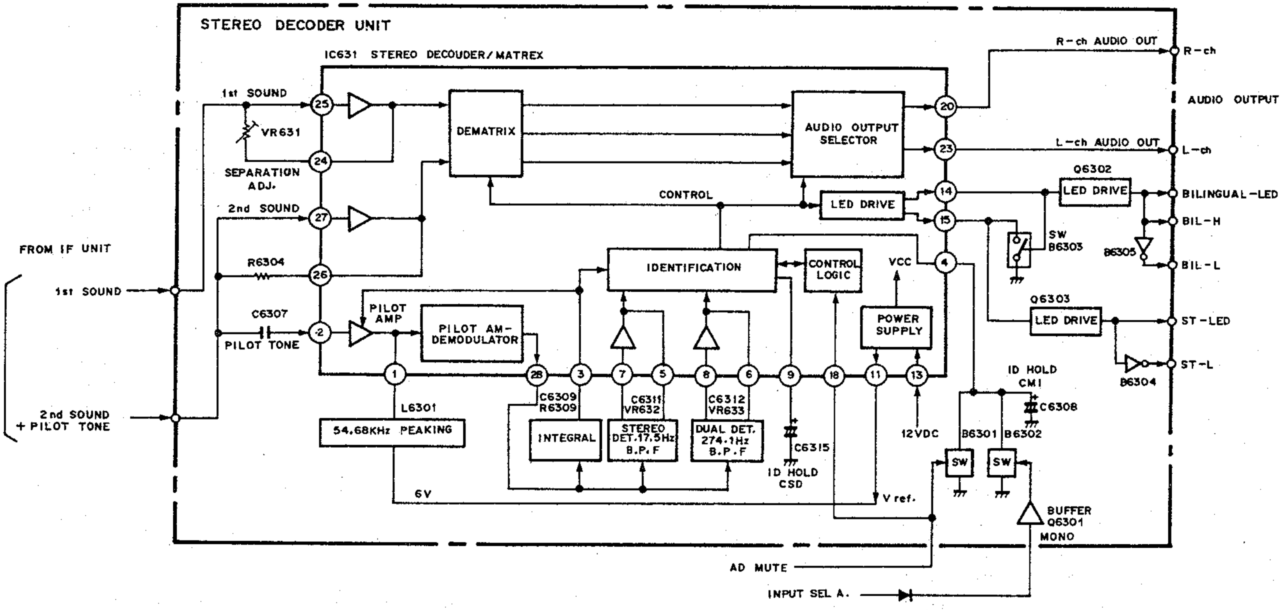
The first audio signal (L + R/2) is input, to IC631 pin 25, and the second audio signal (R) is input to pin 27 of the same IC. These two signals are subjected to (L + R/2 × 2) − R = L by the matrix circuit inside IC631, thus separating to left-channel and right-channel signals.

These signals are output, respectively, from IC631 pin 23 (left-channel) and pin 20 (right-channel).

Dual broadcast:

This first signal (M) is input to IC631 pin 25 and is output from pin 23.

The second signal (S) is input to IC631 pin 27 and is output from pin 26.



STEREO DECODER UNIT
IC631 STEREO DECOUDER/MATREX
FROM IF UNIT
1st SOUND
2nd SOUND + PILOT TONE
1st SOUND
VR631
SEPARATION ADJ.
2nd SOUND
R6304
C6307
PILOT TONE
25
24
27
26
2
DEMATRIX
PILOT AMP
PILOT AM-DEMODULATOR
CONTROL
IDENTIFICATION
1
28
3
7
5
8
6
9
18
11
13
L6301
54.68KHz PEAKING
6V
C6309 R6309
INTEGRAL
C6311 VR632
STEREO DET.17.5Hz B.P.F
C6312 VR633
DUAL DET. 274.1Hz B.P.F
C6315
ID HOLD CSD
AUDIO OUTPUT SELECTOR
LED DRIVE
CONTROL LOGIC
VCC
POWER SUPPLY
12VDC
V ref.
20
23
14
15
4
R-ch AUDIO OUT
L-ch AUDIO OUT
Q6302
LED DRIVE
SW B6303
B6305
Q6303
LED DRIVE
ID HOLD CMI
C6308
B6301
B6302
SW
SW
B6304
BUFFER Q6301
MONO
R-ch
AUDIO OUTPUT
L-ch
BILINGUAL-LED
BIL-H
BIL-L
ST-LED
ST-L
AD MUTE
INPUT SEL A.

Fig. 3.

7. NICAM DECODER CIRCUIT

1. OUTLINE OF THE NICAM BROADCASTING SYSTEM

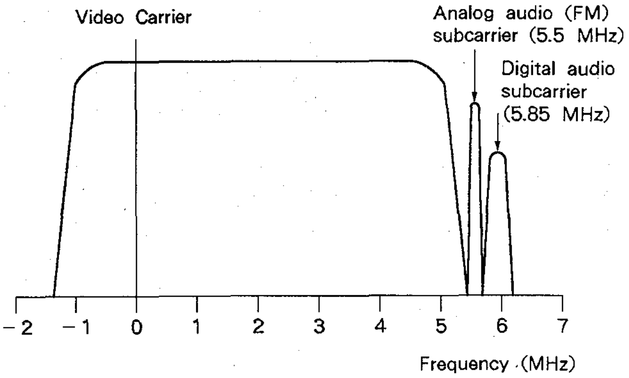
The NICAM (Near Instantaneous Compand Audio Multiplex) broadcasting system uses a digital audio multiplex system (see Table 1) to provide high quality audio signal transmission while keeping compatibility with conventional FM audio (analog) receiving devices (TV, etc.).

		B/G System (SCAN)	I System (UK)
Analog audio	Modulation system	FM	
	Subcarrier frequency	5.5 MHz	6.0 MHz
	Signal level (Video : FM audio)	20 : 1	10 : 1
Digital audio	Modulation system	QPSK (Quadrature Phase Shift Keying) Bit rate : 728 Kbits/s	
	Subcarrier frequency	5.85 MHz	6.552 MHz
	Signal level (Video : FM QPSK)	100 : 1	100 : 1
	Transmission filter rolloff ratio	40 %	100 %

Table 1.

The digital audio signal is transmitted by modulating an extra subcarrier, independent from the conventional FM audio signal, using the QPSK (Quadrature Phase Shift Keying) method. Figs. 1 (a and b) show RF characteristics of NICAM broadcasting. The B/G (SCAN) and I (UK) systems use different digital audio RF modulation methods. In the I system (UK), shown in Fig. 1 (b), there is a relatively wide frequency gap between the conventional FM subcarrier (6.0 MHz) and the NICAM subcarrier (6.552 MHz). On the other hand, the B/G system (SCAN) shown in Fig. 1 (a) has both frequencies more close together, the FM subcarrier being 5.5 MHz and the NICAM subcarrier 5.85 MHz. For this reason, digital signal transmission rolloff ratio has been set to 40 % in the B/G system. This difference in NICAM subcarrier frequency between the B/G and I systems makes it necessary to use subcarrier extracting BPFs (XF671) and QPSK demodulating crystal oscillators (X6701) of different frequencies in decoders used for either system.

(a) B/G System (Baseband Characteristic)



(b) I System (Baseband Characteristic)

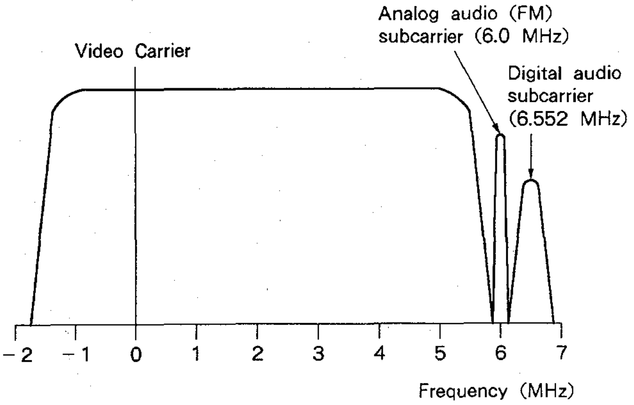


Fig. 1. Specifications of Modulation Parameters

2. NICAM DECODER COMPONENT BLOCKS

Fig. 2 shows a block diagram of the NICAM decoder. The NICAM decoder is composed of the following circuits :

- IC671 : QPSK demodulation circuit.
- IC673 and IC672 :
  PCM decoder circuit.
- IC675 : D/A convertor circuit.
- XF672 and XF673 :
  14 kHz active filter circuit.
- IC676 : Audio amplifier and equalizer circuit.
- IC677 : Normal audio and NICAM audio selection circuit.

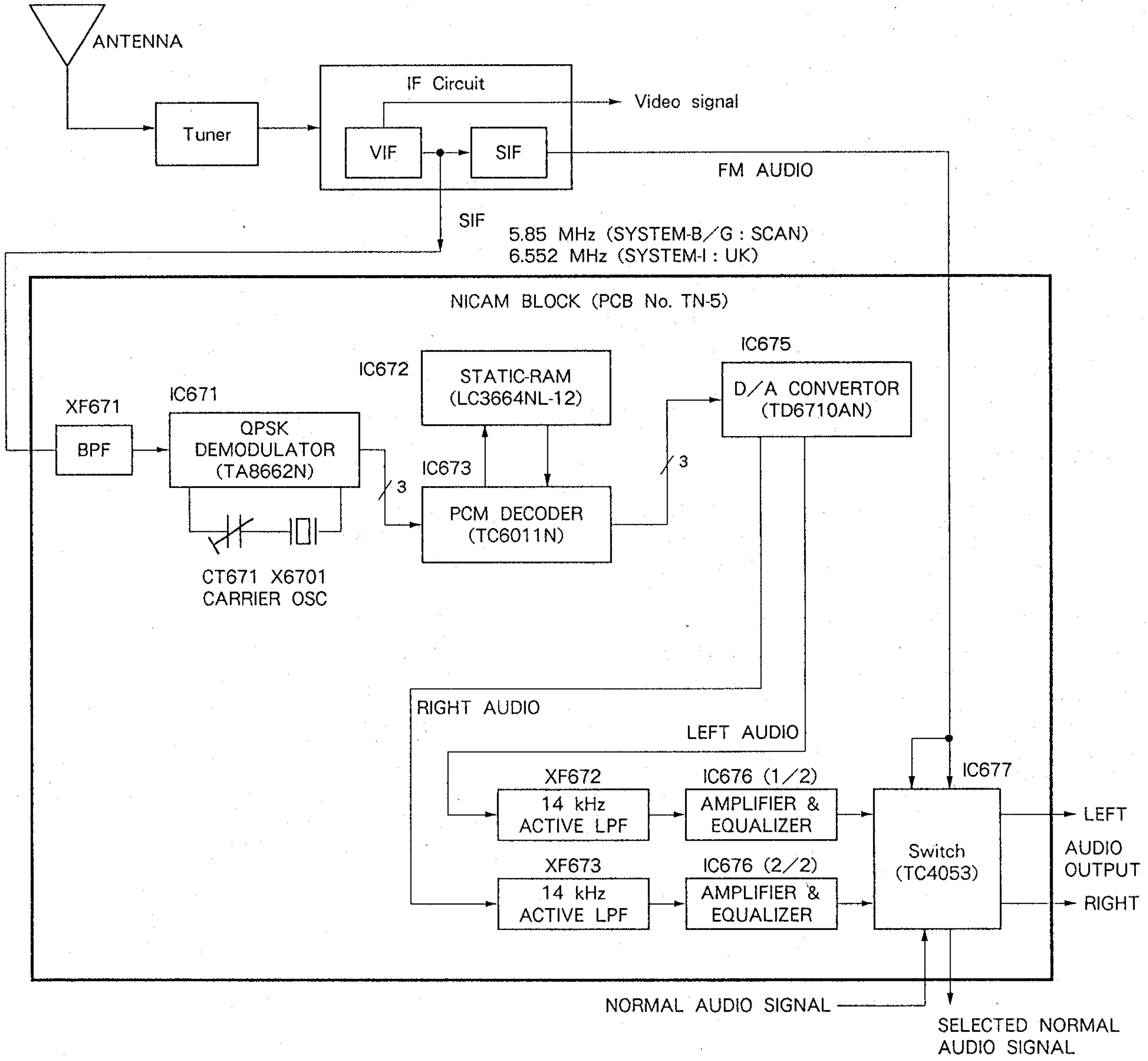

ANTENNA
Tuner
IF Circuit
VIF
SIF
Video signal
FM AUDIO
SIF
5.85 MHz (SYSTEM-B/G : SCAN)
6.552 MHz (SYSTEM-I : UK)
NICAM BLOCK (PCB No. TN-5)
XF671
BPF
IC671
QPSK DEMODULATOR (TA8662N)
CT671 X6701
CARRIER OSC
IC672
STATIC-RAM (LC3664NL-12)
IC673
PCM DECODER (TC6011N)
3
3
IC675
D/A CONVERTOR (TD6710AN)
RIGHT AUDIO
LEFT AUDIO
XF672
14 kHz ACTIVE LPF
IC676 (1/2)
AMPLIFIER & EQUALIZER
XF673
14 kHz ACTIVE LPF
IC676 (2/2)
AMPLIFIER & EQUALIZER
IC677
Switch (TC4053)
LEFT
AUDIO OUTPUT
RIGHT
NORMAL AUDIO SIGNAL
SELECTED NORMAL AUDIO SIGNAL

Fig. 2. Nicam Decoder Block Diagram

3. CIRCUIT OPERATION

(1) QPSK demodulation circuit (IC671:TA8662N)

The SIF signal from the VCR tuner IF circuit passes through a 6 dB amplifier (Q6701) on the TN-5 NICAM decoder board, then it goes into a BPF (6.552 MHz for UK, 5.85 MHz for Scandinavia) to remove all signal components except the NICAM subcarrier and it is input to Pin 4 of the QPSK demodulation IC. The NICAM IF signal modulated by quadrature phase shift keying (QPSK) is demodulated by the reference carrier generated at X6701, then it is output from Pins 10 and 11 as 2-bit binary data. These data are input again through Pins 19 and 20, converted into serial data inside the IC and output from Pin 29. On the other hand, the 5.824 MHz and 728 kHz clock pulses required for PCM decoding on the next stage are generated by oscillation circuits around X6702. These clock pulses are synchronized to the PCM decoder transmission speed of 728 Kbits/s.

(2) PCM decoder (IC673:TC6011N)

The QPSK demodulated serial data are input to Pin 2 of the PCM decoder, and it is decoded into the digital audio data (Pin 10), the shift clock pulse (Pin 8) and the L/R clock pulse (Pin 9) required for D/A conversion (IC675) on the next stage.

Operations carried out inside the PCM decoder include inverse processing of signals scrambled or interleaved at the transmission side for error prevention purposes, discrimination of stereo and other transmission modes from control bits included in the serial data, error recognizing and compensation, expansion from 10 to 14 bits, and muting.

The mode discrimination signals $\overline{\text{STEREO}}$ and BILINGUAL ($\overline{\text{MONO 1}}$ and $\overline{\text{MONO 2}}$) are output from Pins 25, 24 and 23, respectively. There are active when low.

The muting function outputs a high level signal from Pin 11, compulsorily muting the NICAM signal, when the number of errors detected in the serial data reaches a specified limit.

The IC672 S-RAM is a 64 Kbyte RAM with an access time of 12 ms. It is used to write descrambled data in, then read them out while deinterleaving them.

(3) D/A conversion (IC675), LPF (XF672, XF673) and equalizer (IC676)

The digital audio data (DA DATA), the shift clock pulse (SFT CLK) and the L/R clock pulse (L/R CLK) from the PCM decoder are input to the IC675 D/A converter. On the basis of these signals, the D/A converter separates right and left channels, applies sample and hold processing to the signals and outputs them through Pins 1 (left channel) and 12 (right channel). The ninth active low pass filter (XF672 and XF673) on the next stage, with a cutoff frequency of 14 kHz, removes digital processing reflected noise. The noise free audio signal passes through the deemphasis circuit composed of R6725 to R6728 & C6755 for the left channel and R6729 to R6732 & C6758 for the right channel, then it is output to the switch circuit via the frequency characteristic compensation amplifier (IC676).

(4) Switch circuit (IC677)

The switch circuit is controlled so an audio signal matching the VCR specifications is output. Table 2 shows the output signals obtained when the PCM decoder (IC673) has delivered the ST (Pin 25) and BI (Pin 24) discrimination signals, respectively.

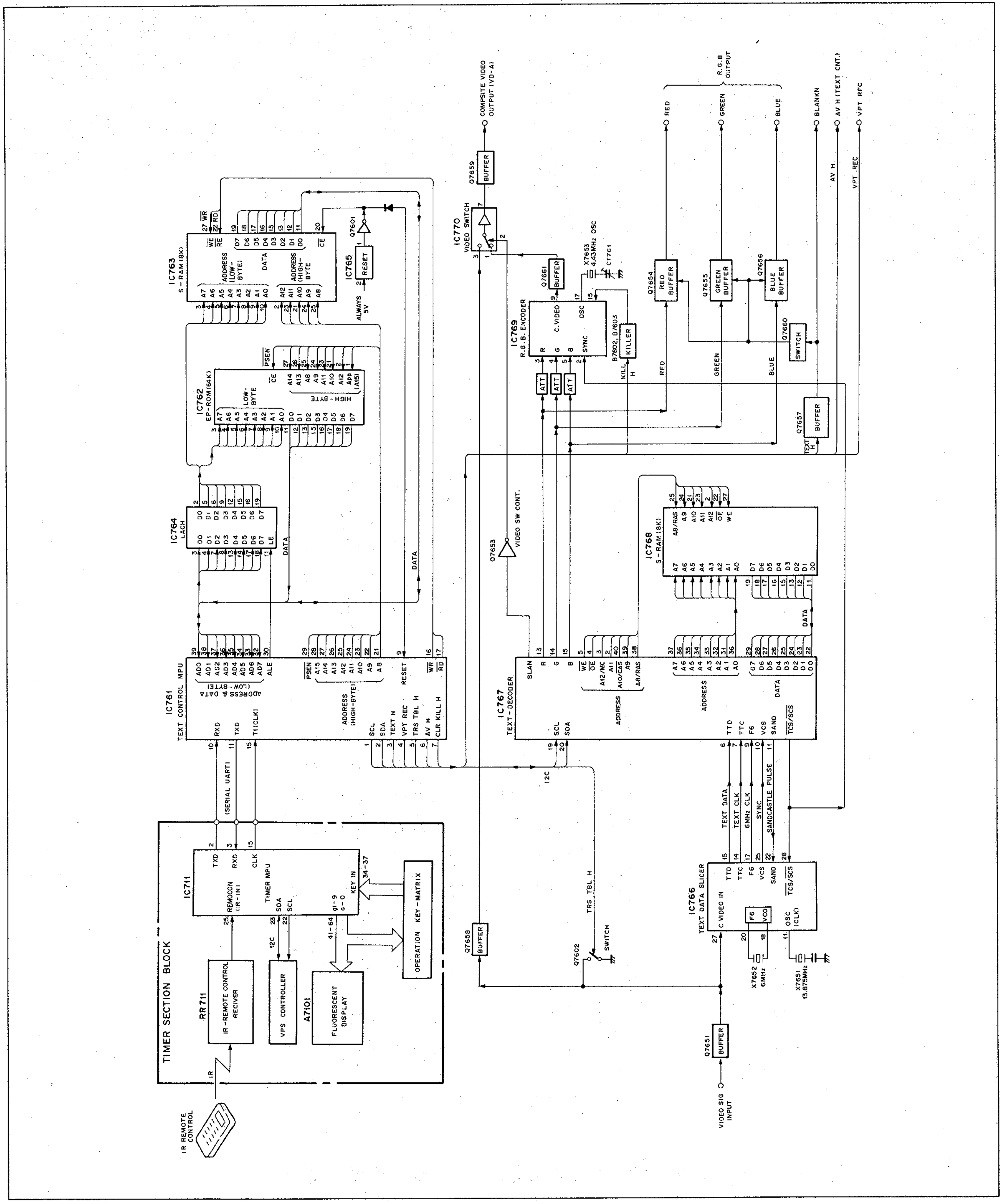
NICAM Transmission Mode	Decoder Discrimination		Signal Supplied to the Hi-Fi Audio Circuit	
	SI	BI	Lch	Rch
Stereo	○	–	L	R
Bilingual monaural, 2 channels	–	○	MONO 1	MONO 2
Monaural, 1 channel + data transmission	–	○	MONO 1	MONO 1
Same as above, with the MONO switch ON	–	–	Analog	Analog
MONO switch OFF (AUTO), weak field	–	–	Analog	Analog

Note : The conventional analog audio signal is always supplied to the normal audio circuit.

Table 2.

8. VIDEOTEXT DECODER CIRCUIT (VPT-unit)

1. OUTLINE



IC761 TEXT CONTROL MPU
IC762 EP-ROM (64K)
IC763 S-RAM (8K)
IC764 LACH
IC765 RESET
IC766 TEXT DATA SLICER
IC767 TEXT-DECODER
IC768 S-RAM (8K)
IC769 R.G.B. ENCODER
IC770 VIDEO SWITCH
IC711 TIMER MPU
TIMER SECTION BLOCK
RR711 IR-REMOTE CONTROL RECIVER
VPS CONTROLLER
A7101 FLUORESCENT DISPLAY
OPERATION KEY-MATRIX
IR REMOTE CONTROL
IR
(SERIAL UART)
I2C
DATA
ALWAYS 5V
Q7601
Q7651 BUFFER
Q7653
Q7654 RED BUFFER
Q7655 GREEN BUFFER
Q7656 BLUE BUFFER
Q7657 BUFFER
Q7658 BUFFER
Q7659 BUFFER
Q7660 SWITCH
Q7661 BUFFER
Q7602 SWITCH
ATT
KILLER
B7602, B7603
X7653 4.43MHz OSC
CT761
X7652 6MHz
X7651 (3.875MHz)
VIDEO SW CONT.
TRS TBL H
TEXT DATA
TEXT CLK
6MHz CLK
SYNC
SANDCASTLE PULSE
VIDEO SIG INPUT
COMPOSITE VIDEO OUTPUT (VD-A)
RED
GREEN
BLUE
R.G.B OUTPUT
BLANKN
AV H (TEXT CNT.)
VPT RFC
AV H
VPT REC
TEXT H

Fig. 1. VIDEOTEXT Decoder Hardware Structure

1-1. FUNCTIONS OUTLINE

This system makes possible the reception of teletext broadcasts with a VCR, as well as the editing in various ways of teletext screen data. In particular, it allows for greatly simplified VCR timer programming by using data from teletext TV program lists.

Furthermore, it uses the character display capability of teletext hardware for editing transmitter table and VCR timer programming data, as well as for calendar, recording history, status and on-screen indications display, among other functions.

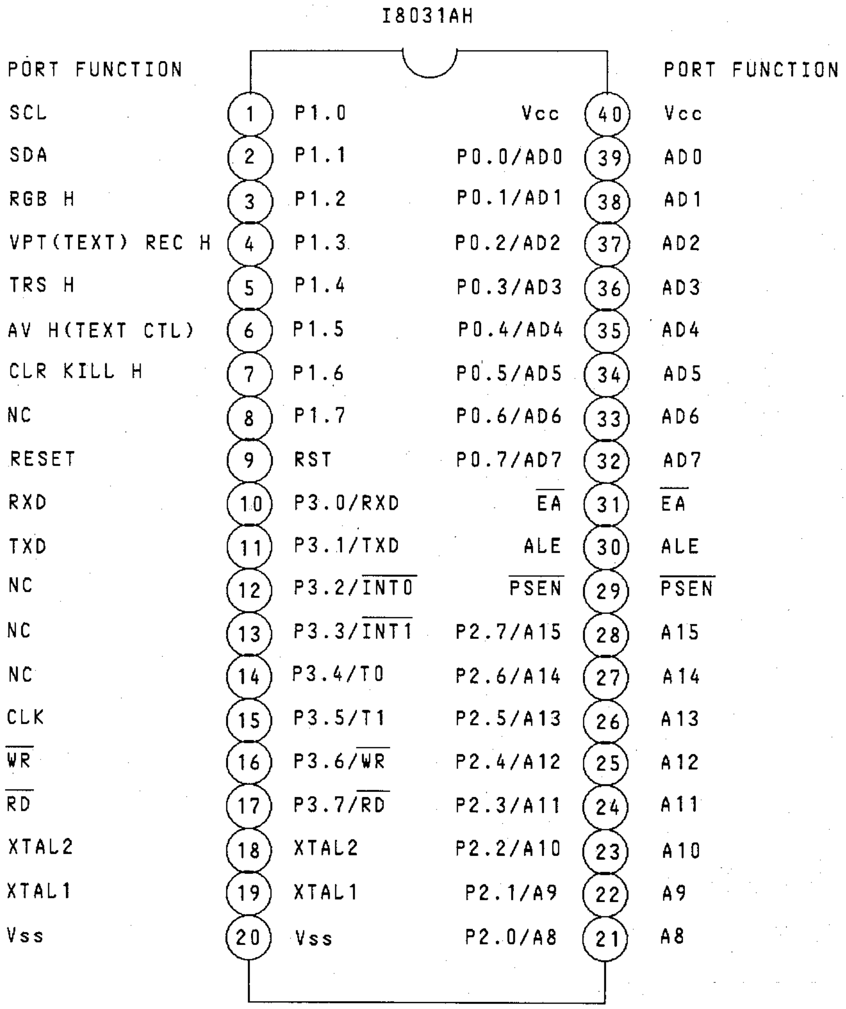
Hardware structure is shown in Fig. 1. An Intel 8031 microprocessor (IC761) is used for text control.Text control microprocessor (IC761) is serially (UART) connected to the timer microprocessor (IC711) and also connected to the text decoder with I2C bus.

A 64-kbyte ROM (IC762) and an 8-kbyte S-RAM (IC763) are provided as external memory.

VPS, channel selection, timer programming, remote control key input and standard VCR operations are all controlled by the timer microprocessor (IC711).

The teletext decoder (IC767) controls teletext page scan display, among other functions, according to the values stored into the 11 internal registers through the I2C bus.

The text control microprocessor (IC761) executes the above functions by controlling the text decoder (IC767) according to key codes and commands from the timer microprocessor (IC711).



PORT FUNCTION	Pin			Pin	PORT FUNCTION
SCL	1	P1.0	Vcc	40	Vcc
SDA	2	P1.1	P0.0/AD0	39	AD0
RGB H	3	P1.2	P0.1/AD1	38	AD1
VPT(TEXT) REC H	4	P1.3	P0.2/AD2	37	AD2
TRS H	5	P1.4	P0.3/AD3	36	AD3
AV H(TEXT CTL)	6	P1.5	P0.4/AD4	35	AD4
CLR KILL H	7	P1.6	P0.5/AD5	34	AD5
NC	8	P1.7	P0.6/AD6	33	AD6
RESET	9	RST	P0.7/AD7	32	AD7
RXD	10	P3.0/RXD	$\overline{\text{EA}}$	31	$\overline{\text{EA}}$
TXD	11	P3.1/TXD	ALE	30	ALE
NC	12	P3.2/$\overline{\text{INT0}}$	$\overline{\text{PSEN}}$	29	$\overline{\text{PSEN}}$
NC	13	P3.3/$\overline{\text{INT1}}$	P2.7/A15	28	A15
NC	14	P3.4/T0	P2.6/A14	27	A14
CLK	15	P3.5/T1	P2.5/A13	26	A13
$\overline{\text{WR}}$	16	P3.6/$\overline{\text{WR}}$	P2.4/A12	25	A12
$\overline{\text{RD}}$	17	P3.7/$\overline{\text{RD}}$	P2.3/A11	24	A11
XTAL2	18	XTAL2	P2.2/A10	23	A10
XTAL1	19	XTAL1	P2.1/A9	22	A9
Vss	20	Vss	P2.0/A8	21	A8

Fig. 2. Pin Layout of the Text Control MPU IC761

PIN	PORT	Signal	Description	TYPE	ACT	I/O
1	P1.0	SCL	Clock pulse output to CCT	P.U.		O
2	P1.1	SDA	Data I/O from/to CCT (serial)	P.U.		I/O
3	P1.2	RGB H	High during RGB output	P.U.	H	O
4	P1.3	VPT (TEXT) REC H	High during text recording	P.U.	H	O
5	P1.4	TRS H	High when the transmitter table is displayed	P.U.	H	O
6	P1.5	AV H (TEXT CTL)	High when a menu, text or VPT picture is displayed	P.U.	H	O
7	P1.6	CLR KILL H	High in the sub-page cancel and TV modes	P.U.	H	O
8	P1.7		NC	P.U.		
9	RST	RESET	Reset input	P.D.	H	I
10	P3.0/RXD	RXD	Data input from the timer microprocessor (serial)	P.U.		I
11	P3.1/TXD	TXD	Data output to the timer microprocessor (serial)	P.U.		O
12	P3.2/INT0		NC	P.U.		
13	P3.3/INT1		NC	P.U.		
14	P3.4/T0		NC	P.U.		
15	P3.5/T1	CLK	Clock pulse (interrupt) input from the timer microprocessor	P.U.		I
16	P3.6/WR	WR	External SRAM write strobe output	P.U.	L	O
17	P3.7/RD	RD	External SRAM read strobe output	P.U.	L	O
18	XTAL2	XTAL2	Input terminal of the oscillator circuit inverted amplifier			I
19	XTAL1	XTAL1	Output terminal of the oscillator circuit inverted amplifier			O
20	Vss	Vss	GND			
21 to 25	P2.0/A8 to P2.2/A12	A8 to A12	External SRAM/ROM address output	P.U.	H	O
26	P2.5/A13	A13	External ROM address output	P.U.	H	O
27	P2.6/A14	A14		P.U.	H	O
28	P2.7/A15	A15	External ROM address output and external SRAM chip enable output	P.U.	H	O
29	PSEN	PSEN	External ROM read strobe output		L	O
30	ALE	ALE	External SRAM/ROM address latch enable output (lower byte)		H	O
31	EA	EA	Always low (readout from the external ROM)		L	I
32 to 39	P0.7/AD7 to P0.0/AD0	AD7 to AD0	External SRAM/ROM address output and data input	O.D.	H	I/O
40	Vcc	Vcc	+ 5V power			

Table 1. Description of Text Control MPU IC761 Ports

(Note) P.U. : Pull Up
P.D. : Pull Down
O.D. : Open Drain

1-2. OUTLINE OF OPERATIONS

All operations of this system are controlled from a remote control unit with the key layout shown in Fig. 3. Functions controlled by each key are as follows.

(1) Text-related Keys

- TEXT : Displays the broadcast text.
- CH +, CH − : Move one page up or down.
- Color (cursor) keys (blue, yellow, green, red) : Call the page assigned to the respective color.
- CANCEL : Sets the cancel mode.
- REVEAL : Displays concealed letters.
- EXPAND : Expands the display area.
- TIME : Calls a sub-page.
- HOLD : Stops page advance.
- NUMERICAL KEYS : For direct page selection and sub-page input.

(2) VPT-related Operation Keys

- VPT : Starts VPT programming.
- Color (cursor) keys (blue, green, red) : Select a program. Change ending time.
- OK : Confirms a program.

(3) Operation Keys for Menu Mode Functions

- MENU : Displays the menu page.
- Numerical keys : Select functions from the menu. Enter numbers used for the various functions.
- Color (cursor) keys (blue, yellow, green, red) : Move the cursor. Change the month on the calendar. Change data on the transmitter table (system, page memory mode). Start broadcasting station name editing. Start timer programming input.
- TITLE : Starts title editing for timer programming. Turns title recording ON/OFF.
- CANCEL : Cancels timer programs, and clears titles during editing . Clears a broadcasting station name during editing on the transmitter table.
- OK : Starts timer programming input and confirms the title and programmed contents. Starts editing on the transmitter table, and confirms broadcasting station names and settings.
- VPS : Turns VPS timer programming ON/OFF.
- SC : Turns simulcast timer programming ON/OFF.
- SPEED : Selects tape speed for programmed recording.

(4) Other Operation Keys

- TV : To watch a TV program.
- STATUS : To turn OSD indications ON/OFF.

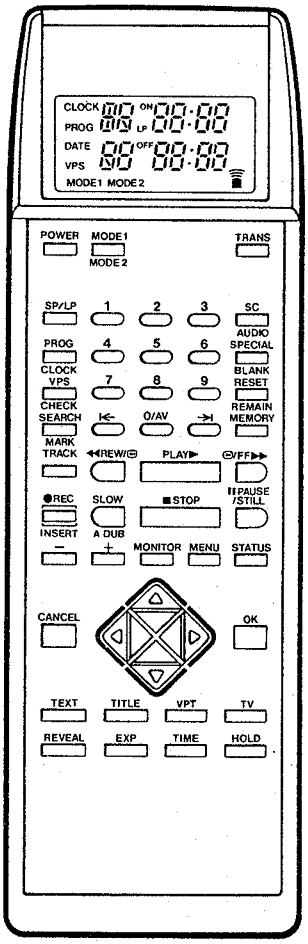

CLOCK
ON
PROG
LP
DATE
OFF
VPS
MODE1 MODE2
POWER
MODE1
MODE2
TRANS
SP/LP
1
2
3
SC
AUDIO SPECIAL
PROG
4
5
6
CLOCK
BLANK
VPS
7
8
9
RESET
CHECK
REMAIN
SEARCH
0/AV
MEMORY
MARK
TRACK
◀◀REW/
PLAY▶
/FF▶▶
●REC
SLOW
■STOP
❚❚PAUSE /STILL
INSERT
A DUB
−
+
MONITOR
MENU
STATUS
CANCEL
OK
TEXT
TITLE
VPT
TV
REVEAL
EXP
TIME
HOLD

Fig. 3. Remote control unit

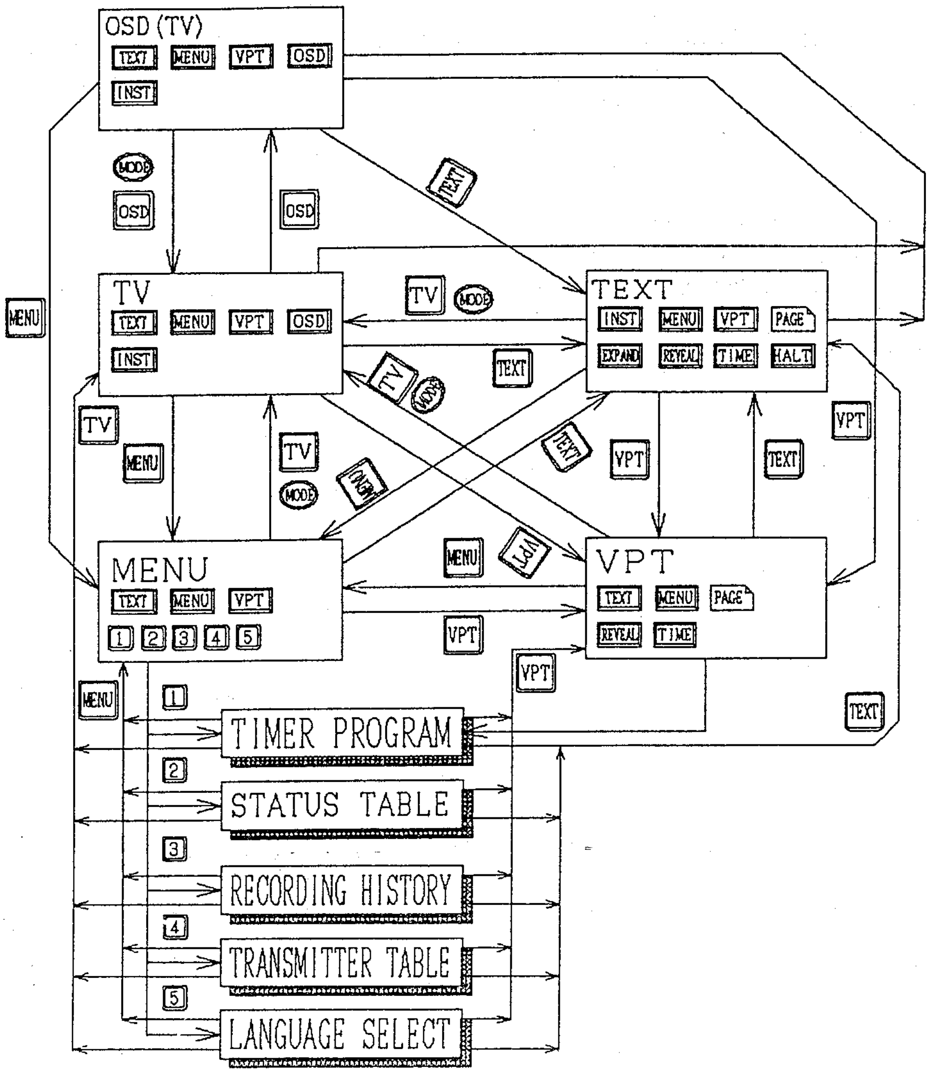
1-3. OPERATION MODES

1-3-1. SWITCHING BETWEEN MODES

The main five operation modes are as follows :

1. TV mode
2. OSD (TV) mode
3. Text mode
4. VPT mode
5. Menu mode

Switching between these modes is illustrated in Fig. 4.


OSD (TV)
TEXT MENU VPT OSD
INST
MODE
OSD
TV
TEXT MENU VPT OSD
INST
TEXT
INST MENU VPT PAGE
EXPAND REVEAL TIME HALT
MENU
VPT
TEXT PAGE
REVEAL TIME
MENU
TEXT MENU VPT
1 2 3 4 5
TIMER PROGRAM
STATUS TABLE
RECORDING HISTORY
TRANSMITTER TABLE
LANGUAGE SELECT

Note : Page indicates operations related to page scan.
MODE indicates a VCR mode change.

Fig. 4. VPT Mode Changes

1-3-2. DESCRIPTION OF EACH MODE

1. TV Mode

This mode includes the following conditions :

① TV reception with no OSD indications displayed
② VCR playback
③ TV or external signal recording
④ Text recording by timer programming

2. OSD (TV) Mode

This refers to TV reception with OSD indications displayed.

3. Text Mode

This mode is for text broadcast reception and manual recording. It has the following sub-modes :

① Normal Mode : Normal watching of the text broadcast.
② Cancel Mode : Condition after a page has been selected and the "CANCEL" key pressed to watch a TV broadcast until the desired page is found.

4. VPT Mode

This refers to the following conditions :

① When the "Press OK button" or "Time data not found" message has appeared on the text screen after pressing the "VPT" key.
② When programming data has been displayed on the text screen after pressing the "OK" key following the condition in ① above.

5. Menu Mode

Functions using the teletext decoder display capability are operated in this mode. It has the following sub-modes :

① Timer Programming :
For programming the VCR through the TV screen.
② Status Table :
The current condition of the VCR is displayed.
③ Recording History :
Displays the last 20 programs recorded.
④ Transmitter Table :
For editing preset channels, station names and text-related data (page memory mode, TV program page, page assigned to each color key) on the TV screen.
⑤ Language Select : To select the language of displayed messages.

2. OPERATION

2-1. WATCHING A TEXT BROADCAST

1. General

When the VIDEO input selector is TUNER position, the text broadcast can be monitored. However, when AV position, it is not shifted to the text mode.

(1) Basic Operation

The text broadcast can be displayed by pressing the TEXT button (see the mode change diagram) in the TV (including OSD) or menu mode. A specific page can be selected by directly entering its number with the numerical keys, changing pages upward or downward with the CH + or CH − key, or pressing the color (cursor) key (red ◀, green ▲, yellow ▶ or blue ▼) assigned to that page. Pages to be assigned to the color (cursor) keys can be designated by the user in the increment and list modes.

(2) Page Read-in

This system preliminarily reads in four teletext pages, including the one currently displayed. There are four page read-in modes that determine which pages are memorized : the increment mode, the list mode, the TOP mode and the FLOF mode (explained in the next section). These page memory modes can be selected by the user. Preliminary page read-in reduces the time required to find a page after it has been selected, allowing for immediate display of the text.

2. Page Memory Modes

(1) Increment Mode

In this mode, the currently displayed page is preliminarily read in together with the previous page and the two following pages. Therefore, the text is displayed immediately when the CH + or CH − key is pressed to move one page up or down.

Example : If page 200 is currently displayed, pages 199, 200, 201 and 202 are read in.

(2) List Mode

In this mode, the four pages assigned by the user to the color (cursor) keys are preliminarily read in. Therefore, the text is displayed immediately when a color (cursor) key is pressed to select the corresponding page.

(3) TOP (Table Of Pages) Mode (see Figs. 2-5 and 2-6)

As in the list mode, the four pages assigned to the color (cursor) keys are preliminarily read in. However, these pages are not designated by the user. The text control microprocessor analyzes the BTT (Basic Top Table) sent from the broadcasting station, which contains information (presence, status, etc.) on all text pages currently transmitted, then assigns the following functions to the four color (cursor) keys :

Blue ▼ : Next box
Yellow ▶ : Next group
Green ▲ : Next page
Red ◀ : Return to previous page

An AIT (Additional Information Page) containing the titles of all pages is also sent from the broadcasting station. This page is analyzed by the text control microprocessor, and titles corresponding to the pages assigned to the four color (cursor) keys are displayed at the bottom line of the screen in place of the page numbers (the page number is displayed for pages whose titles are not included in the AIT).

(4) FLOF (Full-Level One-Feature) Mode

Also in this mode, the four pages assigned to the color (cursor) keys are preliminarily read in, but these pages are designated by the text control microprocessor according to data (commands) from the broadcasting station. These data are :

① Page to be displayed first (initial page). — Packet 8/30
② Pages to be assigned to the four color (cursor) keys (pages to be selected after the current page; link pages). — Packet X/27
③ Link page titles. — Packet X/24

Data ① is sent from the broadcasting station once a second. Data ② and ③ are transmitted together with the selected page data. Also in this mode page titles are received, so the titles of pages assigned to the four color (cursor) keys are displayed at the bottom line of the screen in place of the page numbers (nothing is displayed, however, if no link page information is available). In case no link page data are received, the following functions are assigned to four color (cursor) keys :

Red ◀ : Page up
Green ▲ : Page down
Blue ▼ and Yellow ▶ : No function

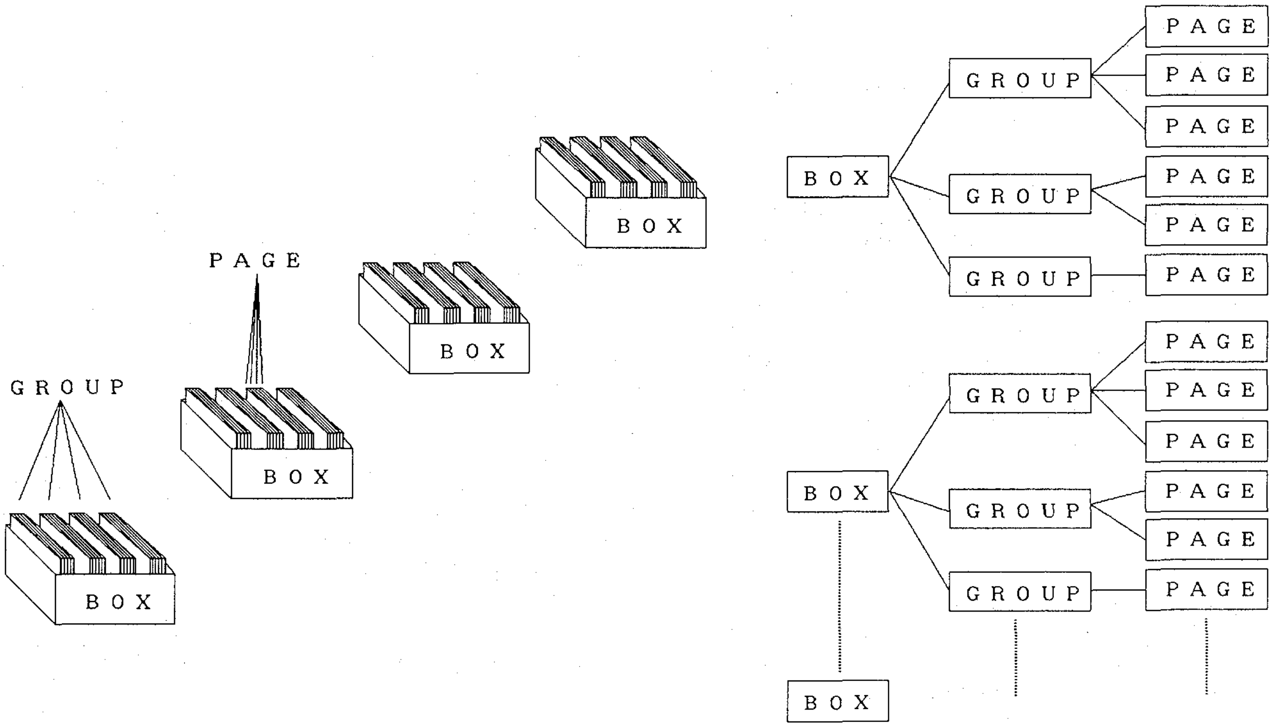

GROUP
PAGE
BOX
BOX
BOX
BOX
BOX
GROUP
GROUP
GROUP
PAGE
PAGE
PAGE
PAGE
PAGE
PAGE
BOX
GROUP
GROUP
GROUP
PAGE
PAGE
PAGE
PAGE
PAGE
PAGE
BOX

Fig. 5. TOP Structure

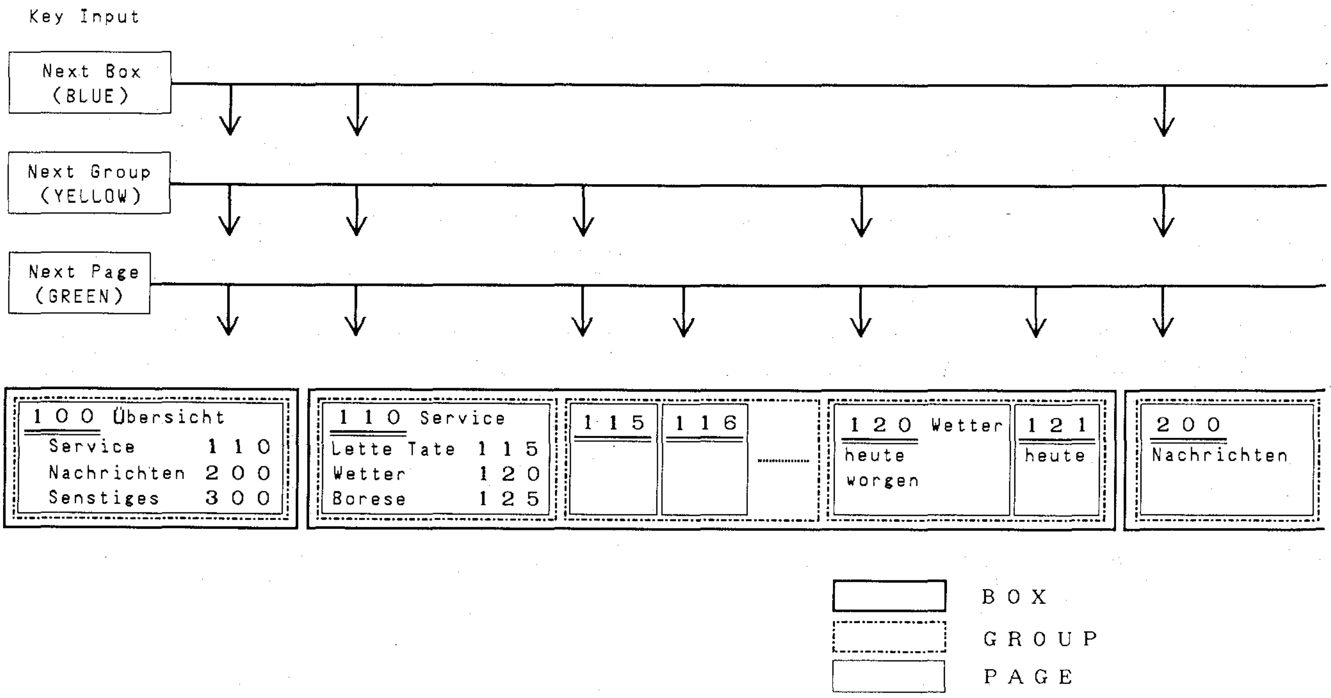

Key Input
Next Box (BLUE)
Next Group (YELLOW)
Next Page (GREEN)
100 Übersicht
Service 110
Nachrichten 200
Senstiges 300
110 Service
Lette Tate 115
Wetter 120
Borese 125
115
116
120 Wetter
heute
worgen
121
heute
200
Nachrichten
BOX
GROUP
PAGE

Fig. 6. TOP Structure

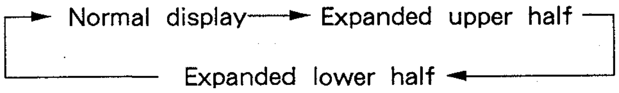
3. Useful Functions

(1) CANCEL
During text broadcast reception, the screen can be switched to TV by pressing the "CANCEL" key after selecting a page or sub-page. When the desired page is found, the indication "Found" is displayed on the screen. This is convenient when searching for hard-to-access pages, for example when there are many sub-pages, etc.

(2) REVEAL
Concealed letters in the text can be seen by pressing the "REVEAL" key. This function is suitable for teletext quiz services, etc. The letters can be hidden again by pressing the "REVEAL" key once more.

(3) HOLD
When receiving a page with one or more sub-pages, pages advance automatically. This can be stopped, however, by pressing the "HOLD" key. The "HOLD" indication is displayed on the upper left of the screen. Normal page advance is resumed by pressing the "HOLD" key again.

(4) EXPAND
If the "EXPAND" key is pressed during text reception, the picture is expanded to twice its height. The display changes in the following sequence when the key is pressed repeatedly :



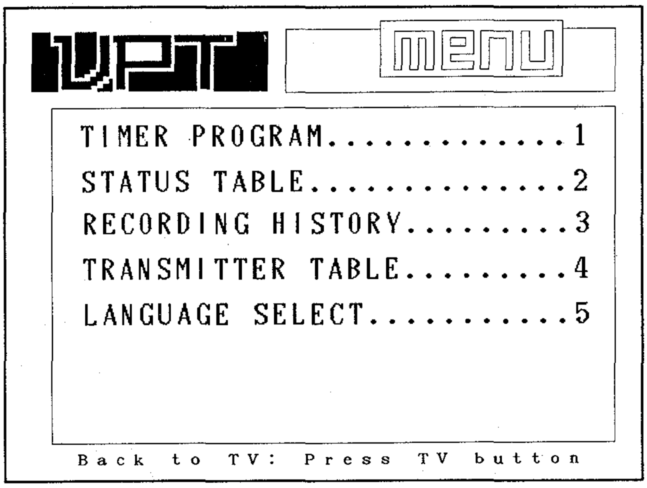
(5) TIME
When receiving a page with one or more sub-pages, pages advance automatically. However, in case the desired sub-page number is known, it can be directly accessed by pressing the "TIME" key (the indication "S * * * *" is displayed), then entering the sub-page number. After the selected sub-page is found and displayed, screen contents do not change. The sub-page mode can be disengaged by pressing the "TIME" key again.

2-2. TIMER PROGRAMMING

1. Manual Input

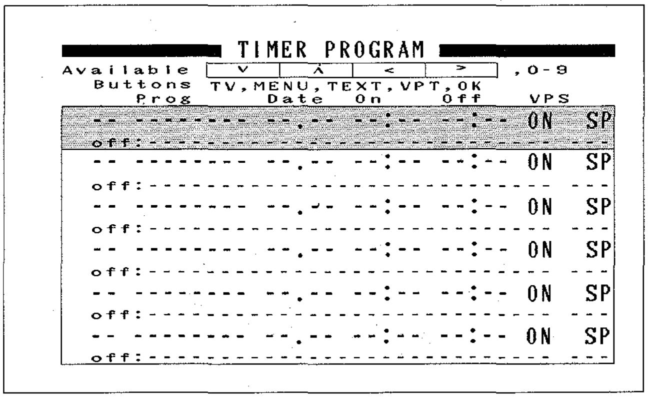
Manual Timer programming is performed by entering the required data from the remote control unit while watching the TV screen. The procedure is as follows :

(1) At the menu page, enter 1 to select "1 : TIMER PROGRAM".



```
TIMER PROGRAM.............1
STATUS TABLE..............2
RECORDING HISTORY.........3
TRANSMITTER TABLE.........4
LANGUAGE SELECT...........5

Back to TV: Press TV button
```

(2) The timer programming page will be displayed.

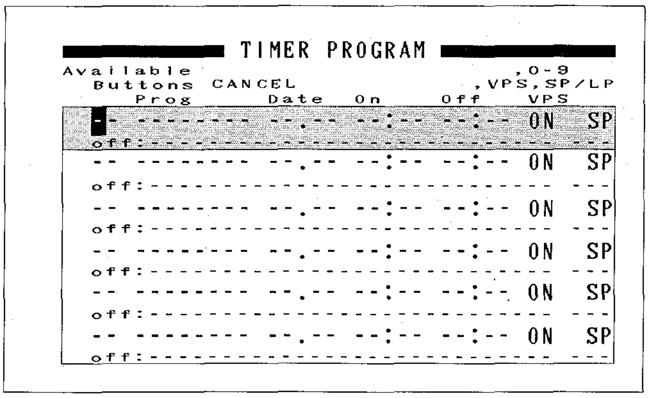


```
           TIMER PROGRAM
Available  [ v | ^ | < | > ] ,0-9
  Buttons  TV,MENU,TEXT,VPT,OK
    Prog          Date   On     Off     VPS
  -- --------- --.-- --:-- --:-- ON  SP
  off:-------------------------- ---
  -- --------- --.-- --:-- --:-- ON  SP
  off:-------------------------- ---
  -- --------- --.-- --:-- --:-- ON  SP
  off:-------------------------- ---
  -- --------- --.-- --:-- --:-- ON  SP
  off:-------------------------- ---
  -- --------- --.-- --:-- --:-- ON  SP
  off:-------------------------- ---
  -- --------- --.-- --:-- --:-- ON  SP
  off:-------------------------- ---
```

(3) Press the "◀", "▶" or "OK" key (you can also enter the position directly with the numerical keys).

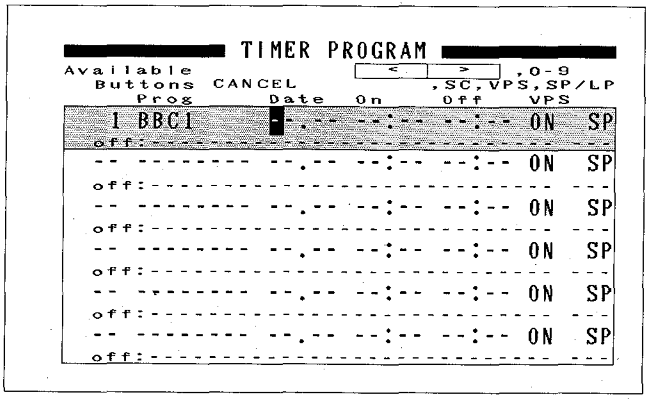
↓

The programming data input mode will be set, and the cursor will be displayed at the position input point.



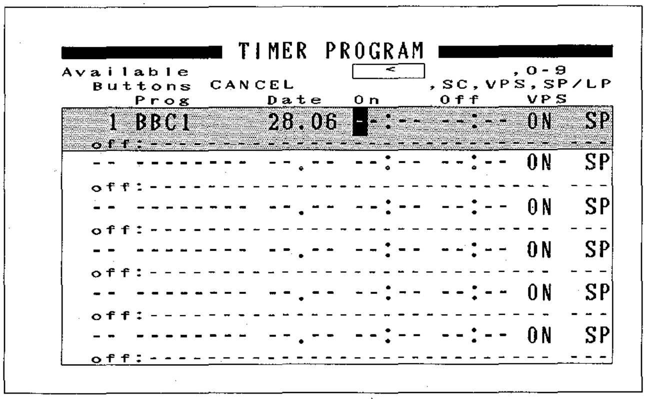
```
                 TIMER PROGRAM
Available                                 ,0-9
  Buttons  CANCEL                  ,VPS,SP/LP
     Prog          Date     On      Off     VPS
█- --------  --.--  --:--  --:--  ON   SP
off:-------------------------------------  ---
-- --------  --.--  --:--  --:--  ON   SP
off:-------------------------------------  ---
-- --------  --.--  --:--  --:--  ON   SP
off:-------------------------------------  ---
-- --------  --.--  --:--  --:--  ON   SP
off:-------------------------------------  ---
-- --------  --.--  --:--  --:--  ON   SP
off:-------------------------------------  ---
-- --------  --.--  --:--  --:--  ON   SP
off:-------------------------------------  ---
```

(4) Enter the position (the broadcasting station name is displayed automatically).



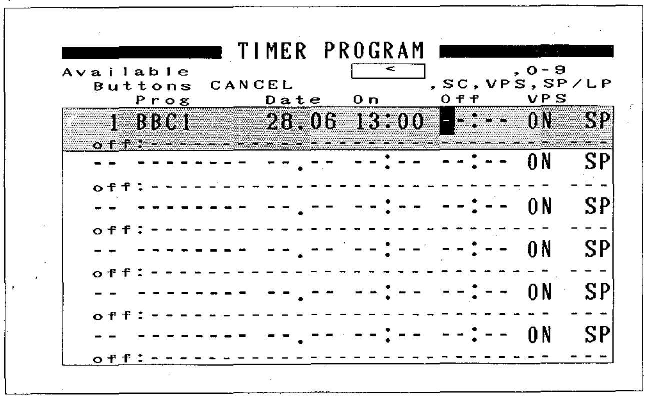
```
                 TIMER PROGRAM
Available                    [ < | > ] ,0-9
  Buttons  CANCEL               ,SC,VPS,SP/LP
     Prog          Date     On      Off     VPS
 1 BBC1      █.--  --:--  --:--  ON   SP
off:-------------------------------------  ---
-- --------  --.--  --:--  --:--  ON   SP
off:-------------------------------------  ---
-- --------  --.--  --:--  --:--  ON   SP
off:-------------------------------------  ---
-- --------  --.--  --:--  --:--  ON   SP
off:-------------------------------------  ---
-- --------  --.--  --:--  --:--  ON   SP
off:-------------------------------------  ---
-- --------  --.--  --:--  --:--  ON   SP
off:-------------------------------------  ---
```

(5) Enter the date (day and month ; the year is displayed automatically).



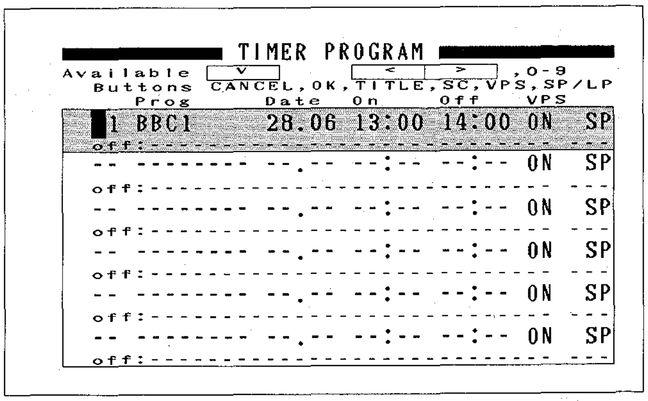
```
                 TIMER PROGRAM
Available                    [ < ]     ,0-9
  Buttons  CANCEL               ,SC,VPS,SP/LP
     Prog          Date     On      Off     VPS
 1 BBC1      28.06  █:--  --:--  ON   SP
off:-------------------------------------  ---
-- --------  --.--  --:--  --:--  ON   SP
off:-------------------------------------  ---
-- --------  --.--  --:--  --:--  ON   SP
off:-------------------------------------  ---
-- --------  --.--  --:--  --:--  ON   SP
off:-------------------------------------  ---
-- --------  --.--  --:--  --:--  ON   SP
off:-------------------------------------  ---
-- --------  --.--  --:--  --:--  ON   SP
off:-------------------------------------  ---
```

(6) Enter the starting time.



```
                 TIMER PROGRAM
Available                    [ < ]     ,0-9
  Buttons  CANCEL               ,SC,VPS,SP/LP
     Prog          Date     On      Off     VPS
 1 BBC1      28.06  13:00  █:--  ON   SP
off:-------------------------------------  ---
-- --------  --.--  --:--  --:--  ON   SP
off:-------------------------------------  ---
-- --------  --.--  --:--  --:--  ON   SP
off:-------------------------------------  ---
-- --------  --.--  --:--  --:--  ON   SP
off:-------------------------------------  ---
-- --------  --.--  --:--  --:--  ON   SP
off:-------------------------------------  ---
-- --------  --.--  --:--  --:--  ON   SP
off:-------------------------------------  ---
```

(7) Enter the ending time.



```
                 TIMER PROGRAM
Available  [ v ]             [ < | > ] ,0-9
  Buttons  CANCEL,OK,TITLE,SC,VPS,SP/LP
     Prog          Date     On      Off     VPS
█1 BBC1      28.06  13:00  14:00  ON   SP
off:-------------------------------------  ---
-- --------  --.--  --:--  --:--  ON   SP
off:-------------------------------------  ---
-- --------  --.--  --:--  --:--  ON   SP
off:-------------------------------------  ---
-- --------  --.--  --:--  --:--  ON   SP
off:-------------------------------------  ---
-- --------  --.--  --:--  --:--  ON   SP
off:-------------------------------------  ---
-- --------  --.--  --:--  --:--  ON   SP
off:-------------------------------------  ---
```

Then proceed to :

(13) to complete the programming procedure.

(8) to record a subtitle or text broadcast.

(10) to record a title.

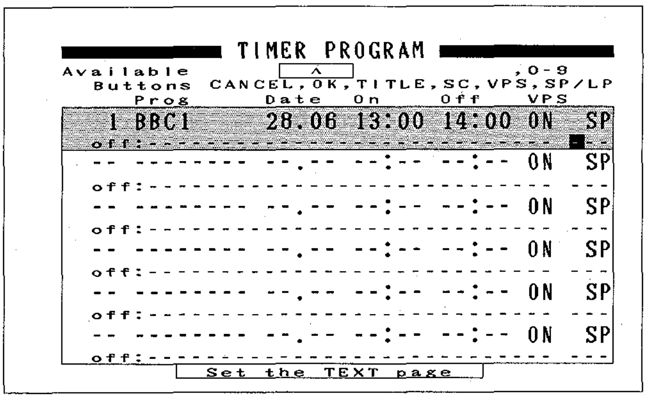
* Subtitles :
Superimposed subtitles for people with hearing difficulties, transmitted as one of teletext services. If this page is included at the time of timer programming, subtitles are recorded together with TV programs.

* Titles :
A 20-second title can be included at the beginning of programs recorded by timer programming. This title can be freely edited, and has a maximum length of 28 letters.

(8) Press the "▼" key.

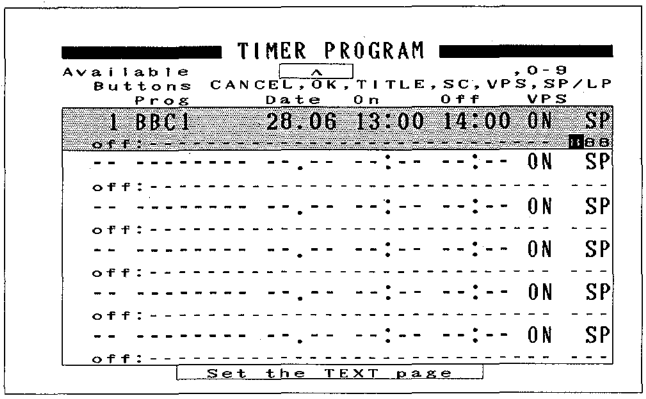
↓

The sub-title page and text page input mode will be set.



```
TIMER PROGRAM
Available          ^                    ,0-9
  Buttons  CANCEL,OK,TITLE,SC,VPS,SP/LP
     Prog          Date   On      Off    VPS
  1 BBC1          28.06 13:00 14:00 ON   SP
  off:-------------------------------- █--
  -- --------  --.-- --:-- --:-- ON   SP
  off:-------------------------------- ---
  -- --------  --.-- --:-- --:-- ON   SP
  off:-------------------------------- ---
  -- --------  --.-- --:-- --:-- ON   SP
  off:-------------------------------- ---
  -- --------  --.-- --:-- --:-- ON   SP
  off:-------------------------------- ---
  -- --------  --.-- --:-- --:-- ON   SP
  off:-------------------------------- ---
           Set the TEXT page
```

(9) Enter the subtitle page or text page.
Then proceed to :
(13) to complete the programming procedure.
(10) to record a title.

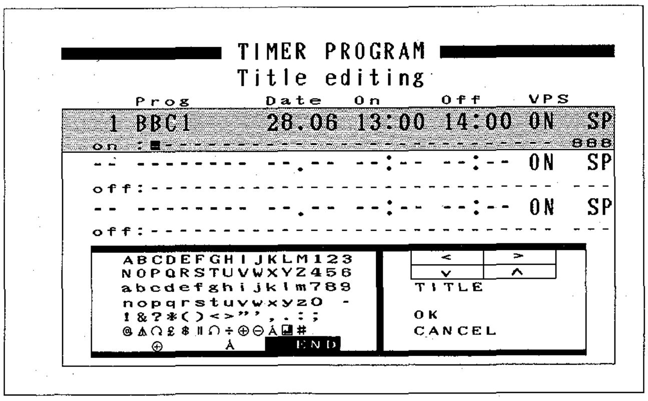


```
TIMER PROGRAM
Available          ^                    ,0-9
  Buttons  CANCEL,OK,TITLE,SC,VPS,SP/LP
     Prog          Date   On      Off    VPS
  1 BBC1          28.06 13:00 14:00 ON   SP
  off:-------------------------------- █88
  -- --------  --.-- --:-- --:-- ON   SP
  off:-------------------------------- ---
  -- --------  --.-- --:-- --:-- ON   SP
  off:-------------------------------- ---
  -- --------  --.-- --:-- --:-- ON   SP
  off:-------------------------------- ---
  -- --------  --.-- --:-- --:-- ON   SP
  off:-------------------------------- ---
  -- --------  --.-- --:-- --:-- ON   SP
  off:-------------------------------- ---
           Set the TEXT page
```

(10) Press the "TITLE" key.

↓

The character table will be displayed, and the title input mode will be set.



```
TIMER PROGRAM
Title editing
     Prog          Date   On      Off    VPS
  1 BBC1          28.06 13:00 14:00 ON   SP
  on  :█------------------------------ 888
  -- --------  --.-- --:-- --:-- ON   SP
  off:-------------------------------- ---
  -- --------  --.-- --:-- --:-- ON   SP
  off:-------------------------------- ---
   ABCDEFGHIJKLM123        <   >
   NOPQRSTUVWXYZ456        v   ^
   abcdefghijklm789      TITLE
   nopqrstuvwxyz0  -
   !&?*()<>"',.:;        OK
   @ΔΩ£$‖∩÷⊕⊖Å▟#         CANCEL
     ⊕     Å    END
```

(11) Enter the title.

* Entering the Title

① Character Input :

(a) Use the "◀", "▶", "▲" and "▼" keys to move the cursor to the desired character on the character table, then press the "OK" key. → The character will be confirmed and input at the cursor position on the title input area, then the cursor will advance one space to the right.

(b) Repeat step (a) for each character of the title.

② Changing Characters :

(a) Move the cursor to the "⇨" ("⇦") position at the bottom line on the character table and press the "OK" key. The cursor on the title input area will move one space to the right or to the left, respectively. Repeat this until the cursor is on the character to be changed, then enter the new character. It will replace the old one.

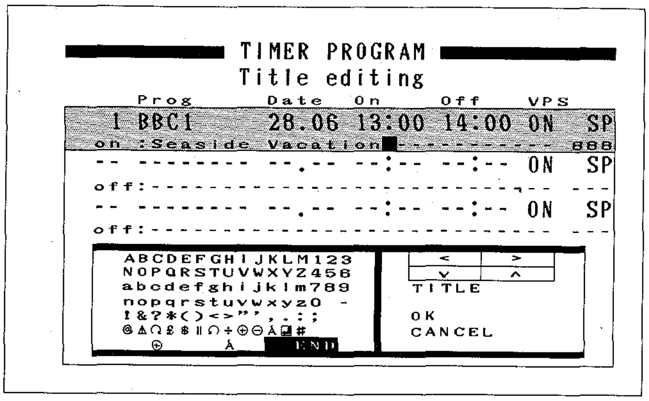
(b) All input characters can be erased by pressing the "CANCEL" key, regardless of the cursor position. The cursor returns to the left of the title input area, so that you can restart title input from the beginning.

③ Title Recording ON/OFF :

Title recording can be turned on/off by pressing the "TITLE" key at the character table.

④ Completing Input :

Once input is finished, press the "OK" key. The character table will disappear and the title will be confirmed. This completes the input procedure.

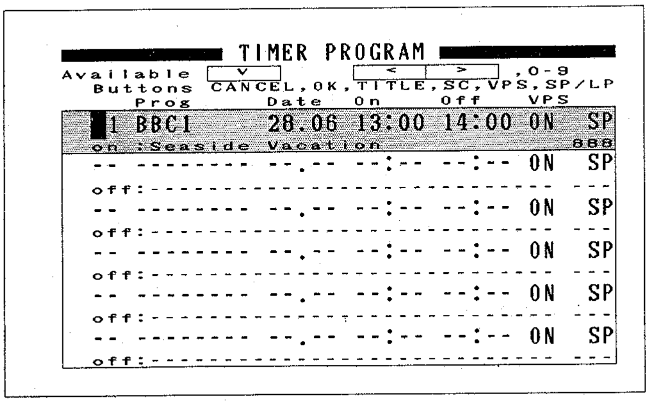


```
TIMER PROGRAM
Title editing
     Prog          Date   On      Off    VPS
  1 BBC1          28.06 13:00 14:00 ON   SP
  on  :Seaside Vacation█-------------- 888
  -- --------  --.-- --:-- --:-- ON   SP
  off:-------------------------------- ---
  -- --------  --.-- --:-- --:-- ON   SP
  off:-------------------------------- ---
   ABCDEFGHIJKLM123        <   >
   NOPQRSTUVWXYZ456        v   ^
   abcdefghijklm789      TITLE
   nopqrstuvwxyz0  -
   !&?*()<>"',.:;        OK
   @ΔΩ£$‖∩÷⊕⊖Å▟#         CANCEL
     ⊕     Å    END
```

(12) Press the "OK" key.

↓

The character table will disappear and the title will be confirmed.

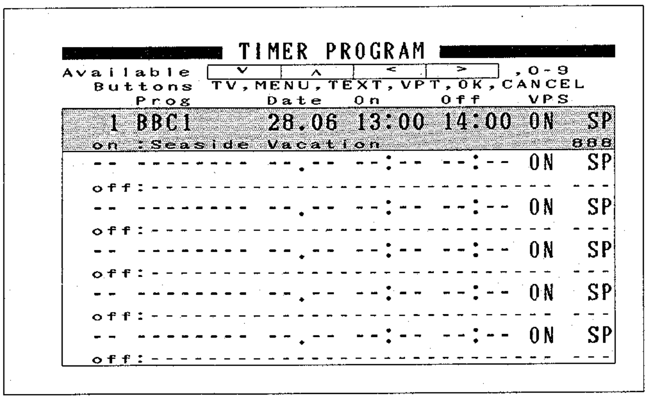


```
TIMER PROGRAM
Available  [ v ]      [ < | > ] ,0-9
  Buttons  CANCEL,OK,TITLE,SC,VPS,SP/LP
    Prog          Date  On      Off     VPS
 █1 BBC1         28.06 13:00 14:00 ON   SP
  on :Seaside Vacation                  888
  -- --------  --.-- --:-- --:-- ON   SP
  off:---------------------------- ---
  -- --------  --.-- --:-- --:-- ON   SP
  off:---------------------------- ---
  -- --------  --.-- --:-- --:-- ON   SP
  off:---------------------------- ---
  -- --------  --.-- --:-- --:-- ON   SP
  off:---------------------------- ---
  -- --------  --.-- --:-- --:-- ON   SP
  off:---------------------------- ---
```

(13) Press the "OK" key.

↓

The cursor will disappear and the programmed contents will be confirmed.



```
TIMER PROGRAM
Available  [ v | ^ | < | > ] ,0-9
  Buttons  TV,MENU,TEXT,VPT,OK,CANCEL
    Prog          Date  On      Off     VPS
  1 BBC1         28.06 13:00 14:00 ON   SP
  on :Seaside Vacation                  888
  -- --------  --.-- --:-- --:-- ON   SP
  off:---------------------------- ---
  -- --------  --.-- --:-- --:-- ON   SP
  off:---------------------------- ---
  -- --------  --.-- --:-- --:-- ON   SP
  off:---------------------------- ---
  -- --------  --.-- --:-- --:-- ON   SP
  off:---------------------------- ---
  -- --------  --.-- --:-- --:-- ON   SP
  off:---------------------------- ---
```

* Simulcast ON/OFF, VPS ON/OFF, Tape Speed Selection :
Simulcast ("SC" key) and VPS ("VPS" key) on/off operations, as well as tape speed selection ("SP/LP" key) are possible at any time under the programming data input condition, except during title input. An "s" is displayed to the right of the position when simulcast is on.

2. VPT (Video Programming by Teletext)

In this mode, the TV program table supplied as one of the teletext services is used to facilitate timer programming. All operations are remote-controlled. The procedure is as follows :

(1) ① From the Text Mode
Search for the TV program table containing the program you want to record and display it.

↓

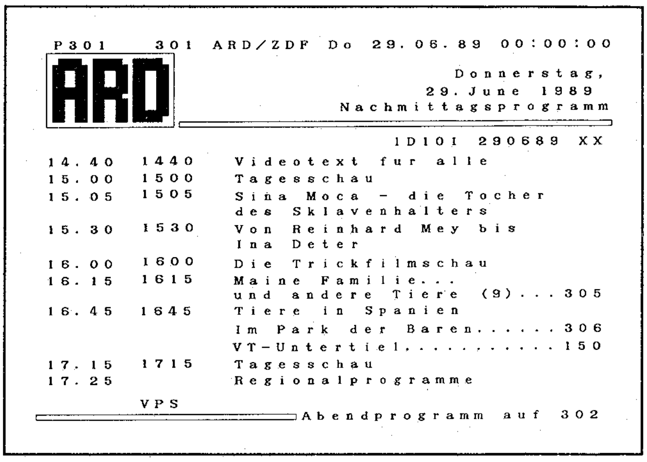
Press the "VPT" key.

② From the TV Mode (including OSD) or the Menu Mode :
Press the "VPT" key.

↓

The page set at the "TV program page" of the transmitter table will be searched for.

If page memory mode at the current position is :
TOP mode, proceed to (3).
Increment, list or FLOF mode, proceed to (2).

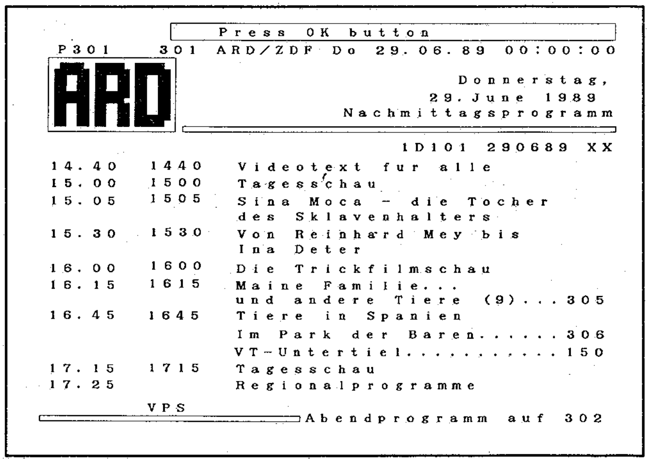


```
P301     301 ARD/ZDF Do 29.06.89 00:00:00
ARD
                               Donnerstag,
                            29. June 1989
                     Nachmittagsprogramm
                         1D101 290689 XX
14.40  1440   Videotext fur alle
15.00  1500   Tagesschau
15.05  1505   Sina Moca - die Tocher
              des Sklavenhalters
15.30  1530   Von Reinhard Mey bis
              Ina Deter
16.00  1600   Die Trickfilmschau
16.15  1615   Maine Familie...
              und andere Tiere (9)...305
16.45  1645   Tiere in Spanien
              Im Park der Baren......306
              VT-Untertiel...........150
17.15  1715   Tagesschau
17.25         Regionalprogramme
         VPS
                 Abendprogramm auf 302
```

(2) The "Press OK button" prompt will be displayed.

↓

If there are sub-pages, they will be scanned. Press the "OK" key when the page containing the desired program is reached.

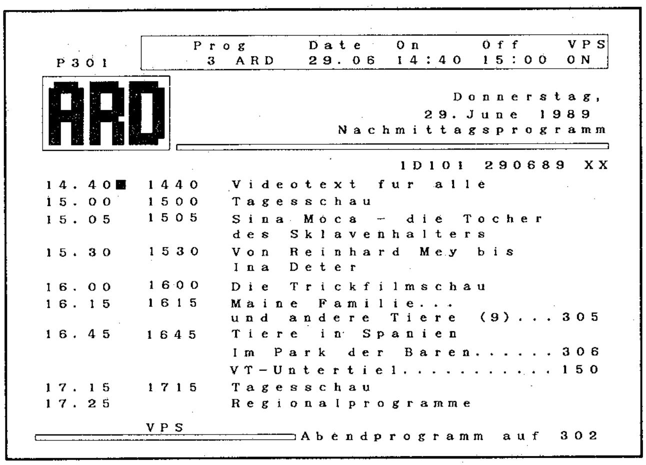


```
                  Press OK button
P301     301 ARD/ZDF Do 29.06.89 00:00:00
ARD
                               Donnerstag,
                            29. June 1989
                     Nachmittagsprogramm
                         1D101 290689 XX
14.40  1440   Videotext fur alle
15.00  1500   Tagesschau
15.05  1505   Sina Moca - die Tocher
              des Sklavenhalters
15.30  1530   Von Reinhard Mey bis
              Ina Deter
16.00  1600   Die Trickfilmschau
16.15  1615   Maine Familie...
              und andere Tiere (9)...305
16.45  1645   Tiere in Spanien
              Im Park der Baren......306
              VT-Untertiel...........150
17.15  1715   Tagesschau
17.25         Regionalprogramme
         VPS
                 Abendprogramm auf 302
```

(3) The cursor will be displayed at the position of the first time data, and programming data will appear at the top line of the screen.

↓

Use the "▼" and "▲" keys to move the cursor to the position of the desired program, then press the "OK" key.



```
        Prog      Date   On     Off    VPS
P301      3 ARD   29.06  14:40  15:00  ON
ARD
                              Donnerstag,
                            29.June 1989
                     Nachmittagsprogramm

                        1D101  290689  XX
14.40■  1440  Videotext fur alle
15.00   1500  Tagesschau
15.05   1505  Sina Moca - die Tocher
              des Sklavenhalters
15.30   1530  Von Reinhard Mey bis
              Ina Deter
16.00   1600  Die Trickfilmschau
16.15   1615  Maine Familie...
              und andere Tiere (9)...305
16.45   1645  Tiere in Spanien
              Im Park der Baren......306
              VT-Untertiel...........150
17.15   1715  Tagesschau
17.25         Regionalprogramme
        VPS
              Abendprogramm auf 302
```

* Programming Data Format
Programming data are analyzed according to the conditions in ② below when the TV program table (page) is recognized to follow the VPT format. Otherwise, conditions in ① below are applied.

① For Pages not Following the VPT Format

(A) Time Data :
A string of four digits, or two groups of digits (one digit in the left group and two in the right one, or two digits in both) with a separator (" . ", " : ", "h") in between, with values suitable as time data (0-24 for hours, 0-59 for minutes) is accepted as time data.
Examples : 0800, 9.20, 22 : 15, 05h45

(B) Date Data :
A character string with two one- or two-digit numbers suitable as date data (1-31 for the day, 1-12 for the month) followed each one by a period (" . "), or a character string indicating the month (three or more characters, 8 languages) with a one- or two-digit number suitable as day data (1-31) separated by a period (" . ") or space (" ") are accepted as date data.
Examples : 25.05., APRIL.12, 05 Jan

(C) Day-of-the-Week Data :
A character string indicating the day of the week (three characters or more, English) is accepted as day-of-the-week data.
Examples : SUNDAY, Mon

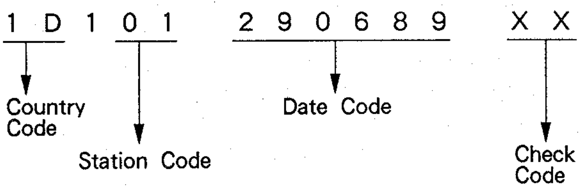
(D) Position :
The current position is programmed. The broadcasting station name set at the corresponding position on the transmitter table is automatically included.

(E) VPS ON/OFF : VPS is turned off.

(F) Data Analysis Conditions :
ⓐ When there are no date or day-of-the-week data on the screen, that program table is reckoned as today's.
ⓑ If time data are received before date and day-of-the-week data, those time data are reckoned as today's.
ⓒ Time data received after date or day-of-the-week data are reckoned to belong to that date until new time data are received.
ⓓ In case two different date or day-of-the-week data are received in succession (no time data in between), the last one takes priority. If day-of-the-week data is received after date data, however, date data takes priority.
ⓔ The same kind of separator should be used for starting and ending times.

②For Pages Under the VPT Format

(A) Date and Position Data :
In VPT-format pages, date and broadcasting station data are included as codes. Dates and positions are obtained by decoding. To determine the position, the broadcasting station name is obtained from the broadcasting station code, then it is compared to names on the transmitter table and the position whose name matches is designated. If no broadcasting station name matches, the present position is designated. The broadcasting station name set for that position on the transmitter table is automatically included.



(B) Time Data :
The format of time data is strictly established, so only data meeting this format are accepted.
Normal time 14.40
VPS time 1440

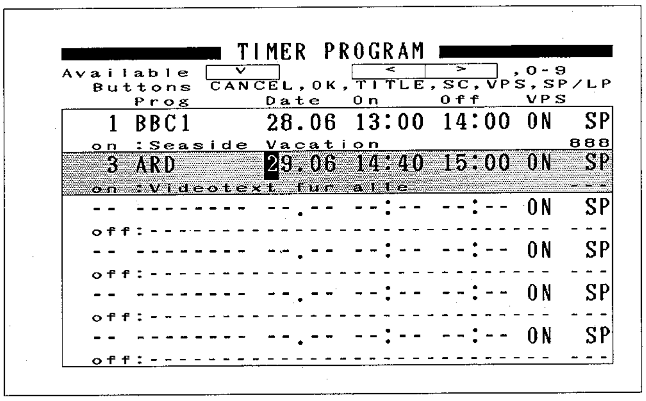
(C) VPS ON/OFF : VPS is turned on.

(D) Data Analysis Conditions :
Starting times should follow the normal time format, and ending times the VPS time format.

(4) The timer programming page will be displayed, including programming data.

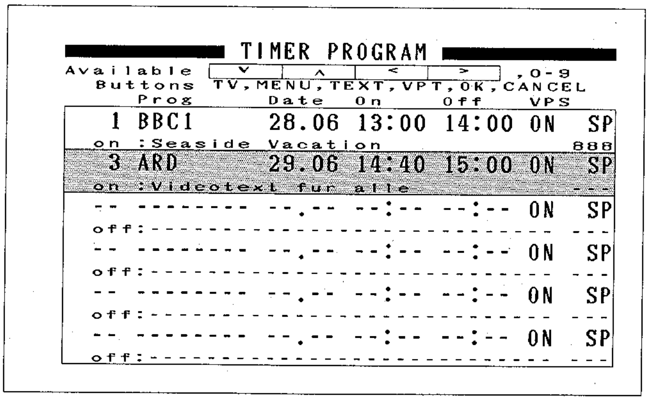
↓

Change or correct the programmed contents if necessary, then press the "OK" key.



```
TIMER PROGRAM
Available [ V ]        [ < | > ] ,0-9
  Buttons CANCEL,OK,TITLE,SC,VPS,SP/LP
    Prog          Date   On     Off    VPS
  1 BBC1          28.06 13:00 14:00 ON   SP
on :Seaside Vacation                    888
  3 ARD           29.06 14:40 15:00 ON   SP
on :Videotext fur alle                  ---
-- --------       --.-- --:-- --:-- ON   SP
off:------------------------------      ---
-- --------       --.-- --:-- --:-- ON   SP
off:------------------------------      ---
-- --------       --.-- --:-- --:-- ON   SP
off:------------------------------      ---
-- --------       --.-- --:-- --:-- ON   SP
off:------------------------------      ---
```

(5) The cursor will disappear, and programmed contents will be confirmed.



```
TIMER PROGRAM
Available [ V | ^ | < | > ] ,0-9
  Buttons TV,MENU,TEXT,VPT,OK,CANCEL
    Prog          Date   On     Off    VPS
  1 BBC1          28.06 13:00 14:00 ON   SP
on :Seaside Vacation                    888
  3 ARD           29.06 14:40 15:00 ON   SP
on :Videotext fur alle                  ---
-- --------       --.-- --:-- --:-- ON   SP
off:------------------------------      ---
-- --------       --.-- --:-- --:-- ON   SP
off:------------------------------      ---
-- --------       --.-- --:-- --:-- ON   SP
off:------------------------------      ---
-- --------       --.-- --:-- --:-- ON   SP
off:------------------------------      ---
```

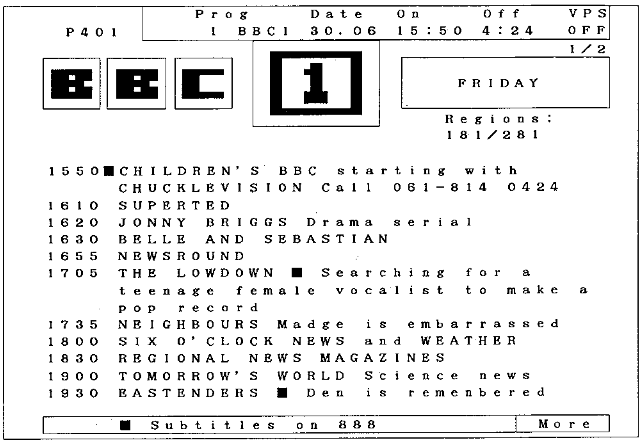
* Changing the Ending Time

If the TV program table (page) is not in VPT format, time data do not follow a determined format, so any data meeting the conditions in "Programming Data Format" ① (A) will be accepted as time data. This includes years (e.g. 1945), telephone numbers (e.g. 061-814 0424) and other similar strings of digits, so there is a danger of wrong programming data input. Data can also be corrected at step (4) above, but this system allows for an easier editing of the ending time at step (3) as follows :

① In the page at left, digits from a telephone number have been wrongly read as time data (4 : 24) instead of the correct ending time 16 : 10.

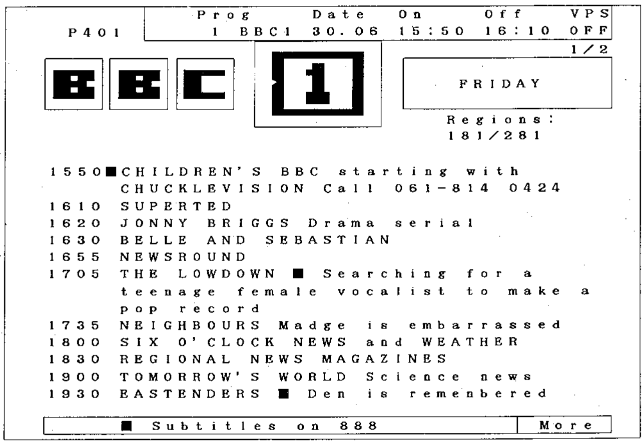
↓

Press the "◀" key to modify the ending time.



```
         Prog     Date   On     Off   VPS
P401      1 BBC1  30.06  15:50  4:24  OFF
                                       1/2
BBC  1                              FRIDAY
                               Regions:
                               181/281

1550■CHILDREN'S BBC starting with
     CHUCKLEVISION Call 061-814 0424
1610 SUPERTED
1620 JONNY BRIGGS Drama serial
1630 BELLE AND SEBASTIAN
1655 NEWSROUND
1705 THE LOWDOWN ■ Searching for a
     teenage female vocalist to make a
     pop record
1735 NEIGHBOURS Madge is embarrassed
1800 SIX O'CLOCK NEWS and WEATHER
1830 REGIONAL NEWS MAGAZINES
1900 TOMORROW'S WORLD Science news
1930 EASTENDERS ■ Den is remenbered
     ■ Subtitles on 888              More
```

② Ending time will change to 16 : 10, the correct programming data.



```
         Prog     Date   On     Off   VPS
P401      1 BBC1  30.06  15:50  16:10 OFF
                                       1/2
BBC  1                              FRIDAY
                               Regions:
                               181/281

1550■CHILDREN'S BBC starting with
     CHUCKLEVISION Call 061-814 0424
1610 SUPERTED
1620 JONNY BRIGGS Drama serial
1630 BELLE AND SEBASTIAN
1655 NEWSROUND
1705 THE LOWDOWN ■ Searching for a
     teenage female vocalist to make a
     pop record
1735 NEIGHBOURS Madge is embarrassed
1800 SIX O'CLOCK NEWS and WEATHER
1830 REGIONAL NEWS MAGAZINES
1900 TOMORROW'S WORLD Science news
1930 EASTENDERS ■ Den is remenbered
     ■ Subtitles on 888              More
```

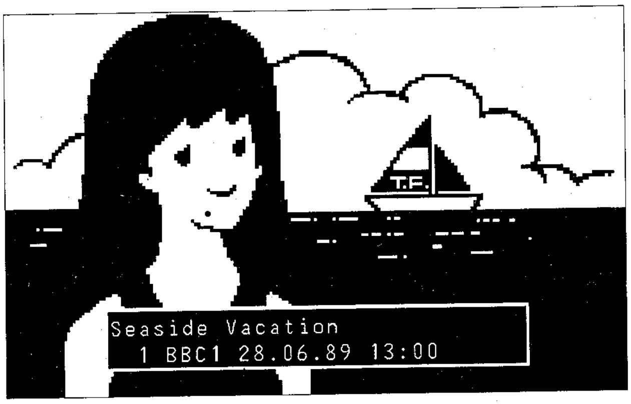
As you can see, when the "◀" key is pressed the next available time data (with the same kind of separator as the starting time) is read as the ending time, allowing for an easy correction of programming data. The ending time setting changes to the next available time data (with the same kind of separator as the starting time) each time the "◀" key is pressed.

Starting Time Ending Time
15 : 50 4 : 24
↓ “◄”
16 : 10
↓ “◄”
16 : 20
↓ “◄”
16 : 30

After the last time data has been reached, ending time gets one hour later each time the “◄” key is pressed.

Starting Time Ending Time
15 : 50 19 : 30
↓ “◄”
20 : 30
↓ “◄”
21 : 30
↓ “◄”

3. Title Recording
Titles are recorded as shown at the bottom of the screen for 20 seconds as recording starts. The title position, the broadcasting station name and the recording date and time are recorded.



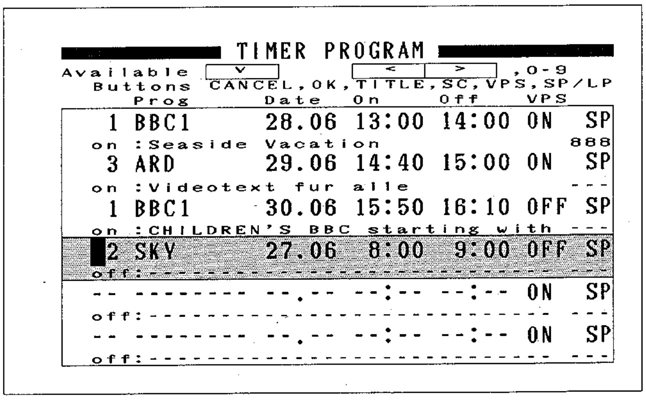
4. Canceling a Program
At the timer programming page (with no cursor displayed), move the cursor (band) appearing on programming data with the “▼” and “▲” keys to the program you want to cancel, then press the “CANCEL” key. Or, simply press the “CANCEL” key in the programming data input/editing condition, with the cursor displayed (except during title input and when the cursor is on the subtitle page (text page) input position during subtitle page (text page) input).

* If the “CANCEL” key is pressed during title input and when the cursor is on the subtitle page (text page) input position during subtitle page (text page) input, the title and subtitle pages (text pages) just entered will be canceled.

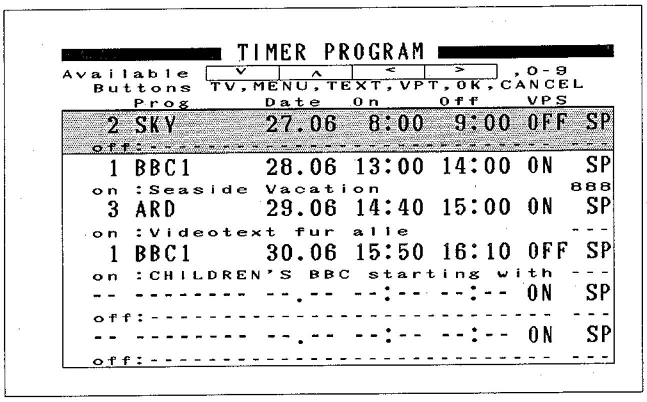
5. Changing a Program
At the timer programming page (with no cursor displayed), move the cursor (band) appearing on programming data with the “▼” and “▲” keys to the program you want to change, press the “◄”, “►” or “OK” key to set the programming data input condition, use the “◄”, “►” and “▼” keys to move the cursor to the data to be altered, then input the new data as explained for initial data input and press the “OK” key. Titles can be modified at any time, except after entering just one digit of numerical data, by pressing the “TITLE” key to call the character table.

6. Program Sorting
In this system, timer programs are not assigned a number, but are always rearranged and displayed in order of execution priority.

(1) After entering programming data, press the “OK” key.


```
TIMER PROGRAM
Available  [ v ]      [ < | > ] ,0-9
  Buttons  CANCEL,OK,TITLE,SC,VPS,SP/LP
    Prog         Date  On    Off   VPS
  1 BBC1        28.06 13:00 14:00 ON   SP
on :Seaside Vacation                  888
  3 ARD         29.06 14:40 15:00 ON   SP
on :Videotext fur alle                ---
  1 BBC1        30.06 15:50 16:10 OFF  SP
on :CHILDREN'S BBC starting with      ---
 █2 SKY         27.06  8:00  9:00 OFF  SP
off:----------------------------      ---
-- --------     --.-- --:-- --:-- ON   SP
off:----------------------------      ---
-- --------     --.-- --:-- --:-- ON   SP
off:----------------------------      ---
```

(2) Programs are rearranged and displayed in order of execution priority.

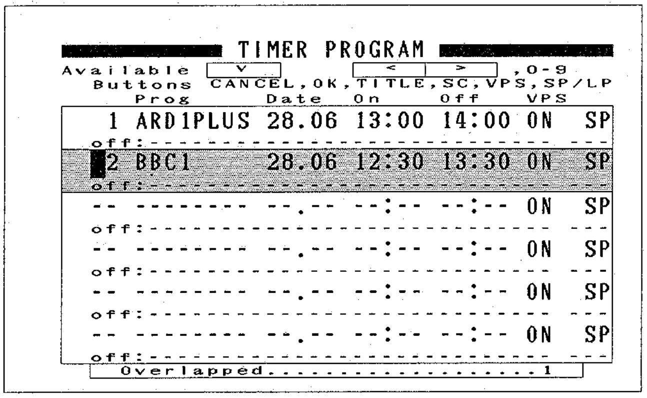

```
TIMER PROGRAM
Available  [ v | ^ | < | > ] ,0-9
  Buttons  TV,MENU,TEXT,VPT,OK,CANCEL
    Prog         Date  On    Off   VPS
  2 SKY         27.06  8:00  9:00 OFF  SP
off:----------------------------      ---
  1 BBC1        28.06 13:00 14:00 ON   SP
on :Seaside Vacation                  888
  3 ARD         29.06 14:40 15:00 ON   SP
on :Videotext fur alle                ---
  1 BBC1        30.06 15:50 16:10 OFF  SP
on :CHILDREN'S BBC starting with      ---
-- --------     --.-- --:-- --:-- ON   SP
off:----------------------------      ---
-- --------     --.-- --:-- --:-- ON   SP
off:----------------------------      ---
```

7. **Warning Messages**

(1) Programming Data Errors

① Programmed time overlapping warning

- This warning message appears, if the programming time overlaps with previous one, when transmitting a confirmed program to timer microprocessor at timer programming on the screen.
- If the "OK" key is pressed to send the signal for confirming and transmitting the renewed program, while the warning message is displayed, the renewed program data is transmitted to the timer microprocessor, and the program will be confirmed.



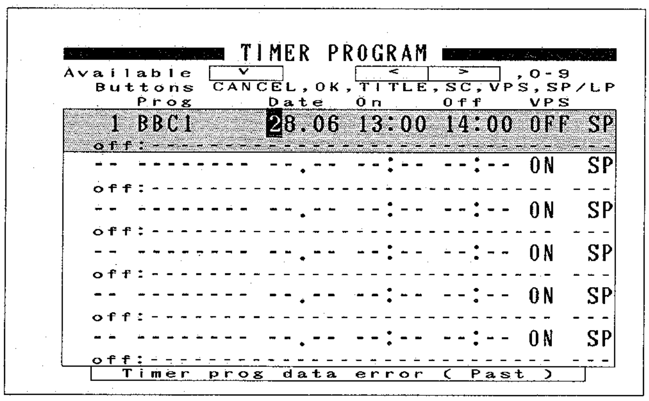
```
            TIMER PROGRAM
Available  [ v ]        [ < | > ] ,0-9
  Buttons  CANCEL,OK,TITLE,SC,VPS,SP/LP
     Prog         Date   On     Off    VPS
  1 ARD1PLUS 28.06 13:00 14:00 ON   SP
 off:----------------------------- ---
 2 BBC1      28.06 12:30 13:30 ON   SP
 off:----------------------------- ---
 -- -------- --.-- --:-- --:-- ON   SP
 off:----------------------------- ---
 -- -------- --.-- --:-- --:-- ON   SP
 off:----------------------------- ---
 -- -------- --.-- --:-- --:-- ON   SP
 off:----------------------------- ---
 -- -------- --.-- --:-- --:-- ON   SP
 off:----------------------------- ---
   Overlapped..................1
```

* The right end figure ("1") of the warning message shows the overlapping program data number.

* The cursor stays where it was when the "OK" key was pressed.

② Past Programming Error :

This error message appears when a past date or time is set with the VPS off. In this case, "a past" means the day before and the time before present. The "Timer prog data error (Past)" appears at the bottom line of the screen, and the cursor moves to the date input position.

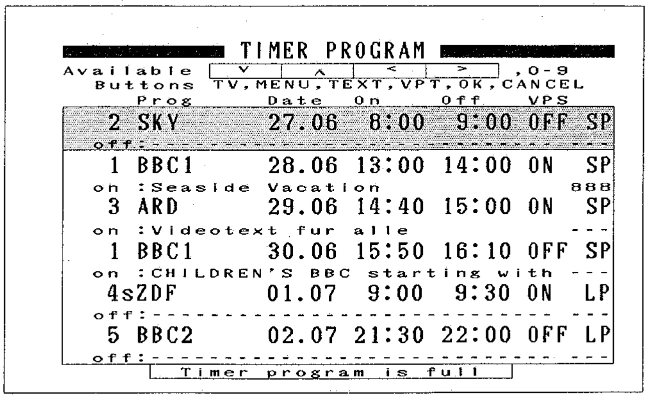


```
            TIMER PROGRAM
Available  [ v ]        [ < | > ] ,0-9
  Buttons  CANCEL,OK,TITLE,SC,VPS,SP/LP
     Prog         Date   On     Off    VPS
  1 BBC1     28.06 13:00 14:00 OFF  SP
 off:----------------------------- ---
 -- -------- --.-- --:-- --:-- ON   SP
 off:----------------------------- ---
 -- -------- --.-- --:-- --:-- ON   SP
 off:----------------------------- ---
 -- -------- --.-- --:-- --:-- ON   SP
 off:----------------------------- ---
 -- -------- --.-- --:-- --:-- ON   SP
 off:----------------------------- ---
 -- -------- --.-- --:-- --:-- ON   SP
 off:----------------------------- ---
  Timer prog data error ( Past )
```

* The error messages above are displayed when the "OK" key is pressed to confirm the program.

(2) Program Capacity Full

This warning message appears when the program capacity is full and the "VPT" key is pressed. The timer programming page is always displayed when pressing the "VPT" key, regardless of the current mode, and the "Timer program is full" message appears at the bottom of the screen to indicate that the timer programming is not possible.



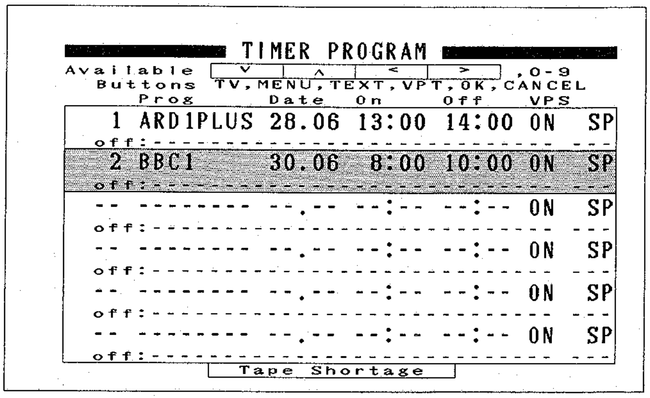
```
            TIMER PROGRAM
Available  [ v | ^ | < | > ] ,0-9
  Buttons  TV,MENU,TEXT,VPT,OK,CANCEL
     Prog         Date   On     Off    VPS
  2 SKY      27.06  8:00  9:00 OFF  SP
 off:----------------------------- ---
  1 BBC1     28.06 13:00 14:00 ON   SP
 on :Seaside Vacation              888
  3 ARD      29.06 14:40 15:00 ON   SP
 on :Videotext fur alle            ---
  1 BBC1     30.06 15:50 16:10 OFF  SP
 on :CHILDREN'S BBC starting with  ---
  4sZDF      01.07  9:00  9:30 ON   LP
 off:----------------------------- ---
  5 BBC2     02.07 21:30 22:00 OFF  LP
 off:----------------------------- ---
      Timer program is full
```

(3) Remaining tape shortage warning

① This warning message appears, if the tape remains less than the length of total programmed time, when transmitting confirmed programs to timer microprocessor at timer programming on the screen.

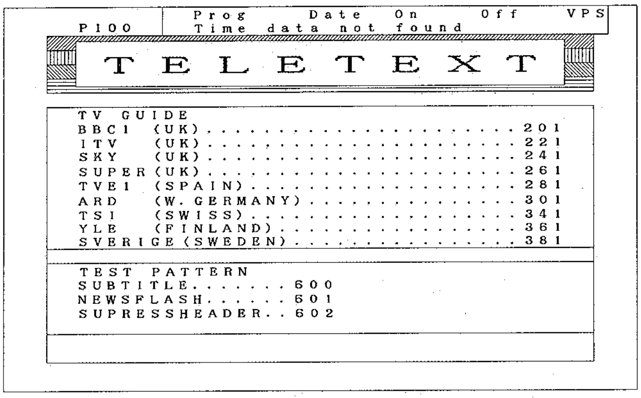
② This warning message appears, if the tape remains less than the length of total programmed time, when a program is transmitted from the remote controller while the timer program screen is displayed.

③ This warning message appears, if the tape remains less than the length of total programmed time, when a tape is inserted while the timer program screen is displayed or the tape status is changed by forwarding or rewinding a tape.



```
            TIMER PROGRAM
Available  [ v | ^ | < | > ] ,0-9
  Buttons  TV,MENU,TEXT,VPT,OK,CANCEL
     Prog         Date   On     Off    VPS
  1 ARD1PLUS 28.06 13:00 14:00 ON   SP
 off:----------------------------- ---
  2 BBC1     30.06  8:00 10:00 ON   SP
 off:----------------------------- ---
 -- -------- --.-- --:-- --:-- ON   SP
 off:----------------------------- ---
 -- -------- --.-- --:-- --:-- ON   SP
 off:----------------------------- ---
 -- -------- --.-- --:-- --:-- ON   SP
 off:----------------------------- ---
 -- -------- --.-- --:-- --:-- ON   SP
 off:----------------------------- ---
    Tape Shortage
```

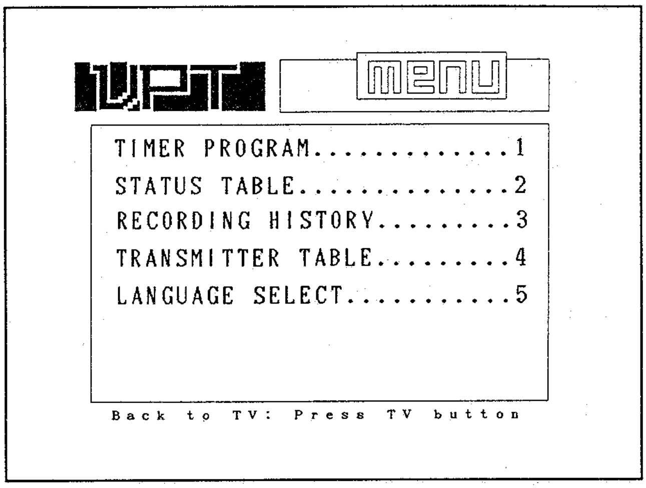
(4) No Time Data
This message appears when the "OK" key ("VPT" key is pressed when the TOP page memory mode is set at the current position) is pressed following the "Press OK button" prompt during VPT timer programming and there is no time data available. The "Time data not found" message is displayed at the programming data display position (top of the screen).



```
P100   Prog    Date   On    Off    VPS
       Time data not found
              TELETEXT
TV GUIDE
BBC1  (UK)........................201
ITV   (UK)........................221
SKY   (UK)........................241
SUPER (UK)........................261
TVE1  (SPAIN).....................281
ARD   (W. GERMANY)................301
TSI   (SWISS).....................341
YLE   (FINLAND)...................361
SVERIGE (SWEDEN)..................381

TEST PATTERN
SUBTITLE.......600
NEWSFLASH......601
SUPRESSHEADER..602
```

2-3. USING MENU MODE FUNCTIONS

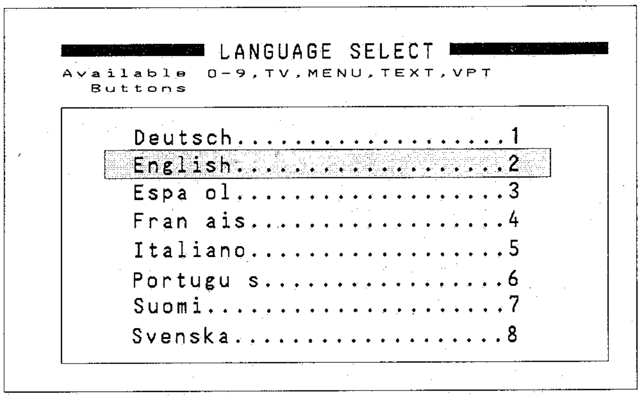
Menu mode functions are selected by pressing the corresponding numerical key. Function No. 3 "SPECIAL CODE TABLE" can also be selected by pressing the "INST" key in the TV (including OSD) and text modes (refer to the mode change diagram).



```
VPT  menu
TIMER PROGRAM.............1
STATUS TABLE..............2
RECORDING HISTORY.........3
TRANSMITTER TABLE.........4
LANGUAGE SELECT...........5

Back to TV: Press TV button
```

1. Language Selection
In this system, messages can be displayed in eight different languages (German, English, Spanish, French, Italian, Portuguese, Finnish and Swedish). The language can be selected by the user as follows :

(1) At the menu page, enter 6 to select "LANGUAGE SELECT".
(2) The language selection page will be displayed (the cursor will appear on the currently selected language).
↓
Select the desired language by entering the corresponding number.
↓
The cursor (band) will move to the position of the selected language, and the "LANGUAGE SELECT" and "Available Buttons" words at the top of the screen will change to that language.



```
LANGUAGE SELECT
Available  0-9,TV,MENU,TEXT,VPT
  Buttons
Deutsch..................1
English..................2
Espa ol..................3
Fran ais.................4
Italiano.................5
Portugu s................6
Suomi....................7
Svenska..................8
```

* English is set as the default language.

2. Transmitter Table

This function is used for channel presetting, broadcasting station name editing and text-related settings (page memory mode, TV PROGRAM PAGE [page called by the "VPT" key], pages called by the four color (cursor) keys [red, green, yellow and blue]). The respective procedures are as follows :

(1) At the menu page, enter 5 to select "TRANSMITTER TABLE".

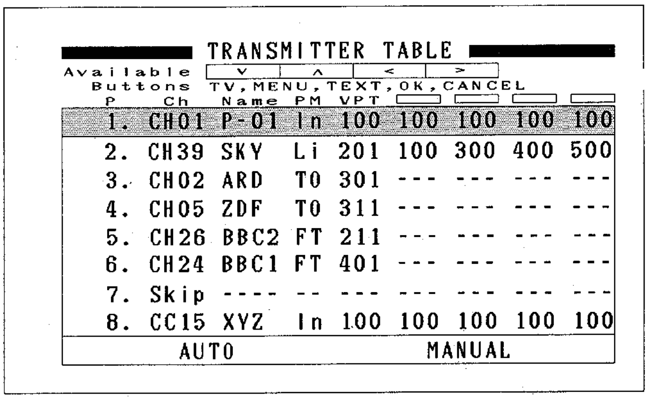
(2) The settings for each position will be displayed (the cursor (band) will be displayed at the current position).

↓

Use the "▼" (one line down), "▲" (one line up), "◀" (one page scroll down) and "▶" (one page scroll up) keys to move the cursor to the position whose setting is to be changed.

↓

Press the "OK" key.



TRANSMITTER TABLE

Available Buttons [v | ^ | < | >] TV, MENU, TEXT, OK, CANCEL

P	Ch	Name	PM	VPT	▭	▭	▭	▭
1.	CH01	P-01	In	100	100	100	100	100
2.	CH39	SKY	Li	201	100	300	400	500
3.	CH02	ARD	TO	301	---	---	---	---
4.	CH05	ZDF	TO	311	---	---	---	---
5.	CH26	BBC2	FT	211	---	---	---	---
6.	CH24	BBC1	FT	401	---	---	---	---
7.	Skip	----	--	---	---	---	---	---
8.	CC15	XYZ	In	100	100	100	100	100

AUTO MANUAL

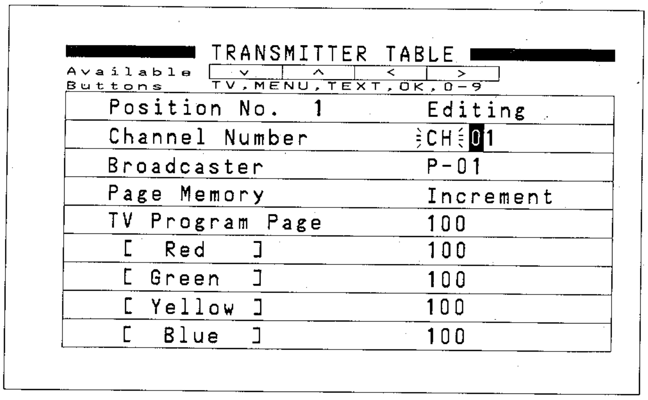
(3) The setting page for the selected position will be displayed, the system indication ("CH") on the "Channel Number" line will blink and the cursor will appear at the channel input position.

↓

Use the "◀" and "▶" keys to select the system. Each time the "◀" key is pressed, the setting changes in the following order: CH→Skip →CC→CH (the order is opposite for the "▶" key).

↓

Enter the channel with the numerical keys.



TRANSMITTER TABLE

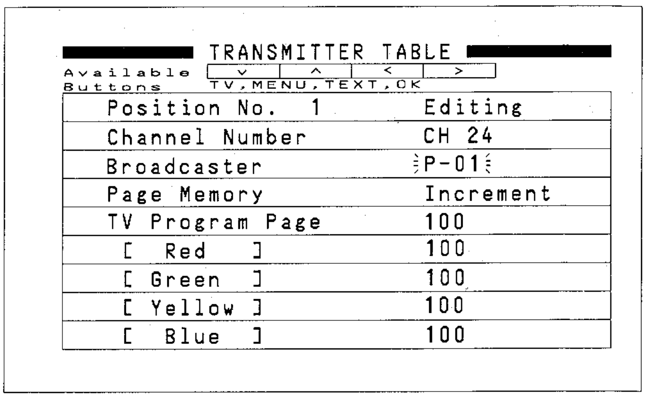
Available Buttons [v | ^ | < | >] TV, MENU, TEXT, OK, 0-9

Position No. 1	Editing
Channel Number	CH 01
Broadcaster	P-01
Page Memory	Increment
TV Program Page	100
[Red]	100
[Green]	100
[Yellow]	100
[Blue]	100

(4) The station name on the "Broadcaster" line will start blinking.

↓

Press the "◀" or "▶" key.

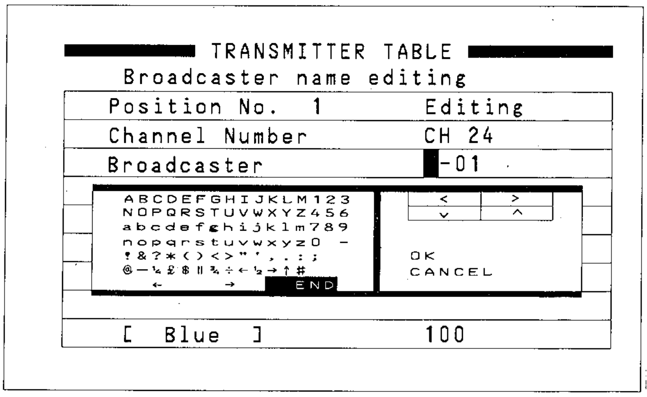


TRANSMITTER TABLE

Available Buttons [v | ^ | < | >] TV, MENU, TEXT, OK

Position No. 1	Editing
Channel Number	CH 24
Broadcaster	P-01
Page Memory	Increment
TV Program Page	100
[Red]	100
[Green]	100
[Yellow]	100
[Blue]	100

(5) The character table will be displayed, and the system will be ready for station name input.



TRANSMITTER TABLE

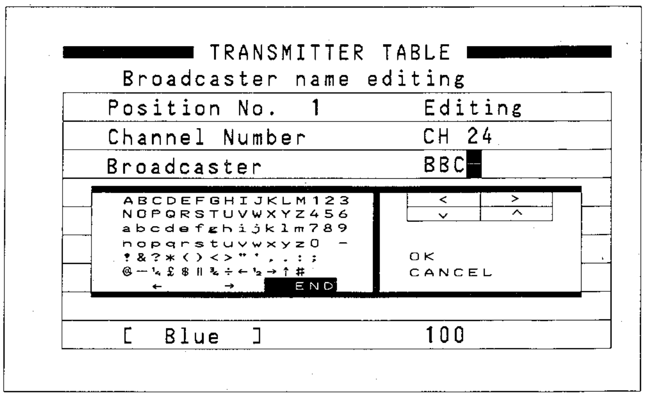
Broadcaster name editing

Position No. 1	Editing
Channel Number	CH 24
Broadcaster	-01
[Blue]	100

(6) Enter the station name. Refer to "Entering the Title" in section 2-4-2. 1. Manual Input (excluding title recording ON/OFF).

↓

Press the "OK" key.



TRANSMITTER TABLE

Broadcaster name editing

Position No. 1	Editing
Channel Number	CH 24
Broadcaster	BBC
[Blue]	100

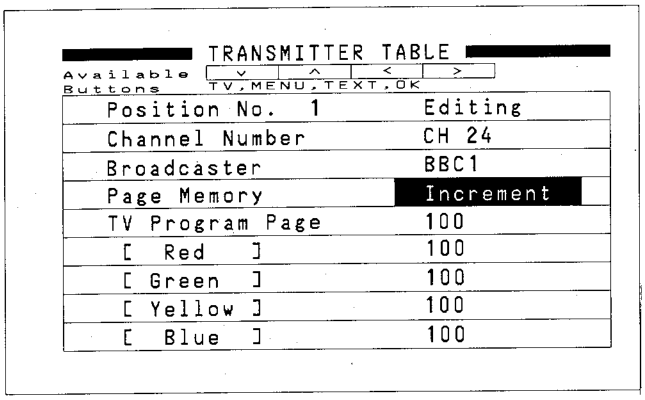
(7) The character table will disappear, and the cursor will be displayed on the "Page Memory" line.

↓

Use the "◀" and "▶" keys to select the page memory mode. Each time the "◀" key is pressed, the setting changes in the following order : Increment → FASTEXT → TOP → List → Increment (the order is opposite for the "▶" key).

↓

Press the "▼" key.



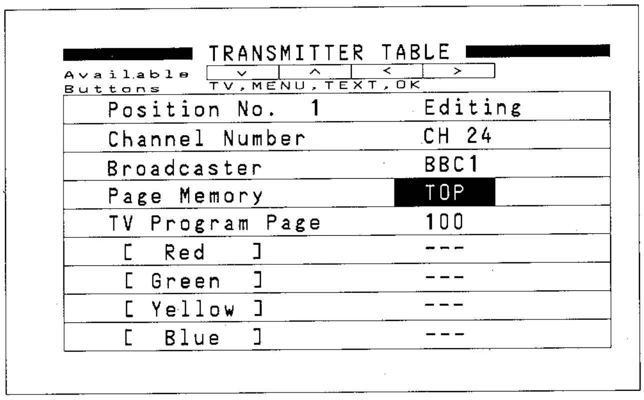
TRANSMITTER TABLE

Available Buttons [v | ^ | < | >] TV,MENU,TEXT,OK

Position No. 1	Editing
Channel Number	CH 24
Broadcaster	BBC1
Page Memory	Increment
TV Program Page	100
[Red]	100
[Green]	100
[Yellow]	100
[Blue]	100

* Since pages cannot be assigned to the color (cursor) keys in the TOP and FLOF modes, "– – –" is displayed at the color(cursor)key page display positions and the cursor will not move farther than the "[Red]" line.

Example : In the TOP mode :



TRANSMITTER TABLE

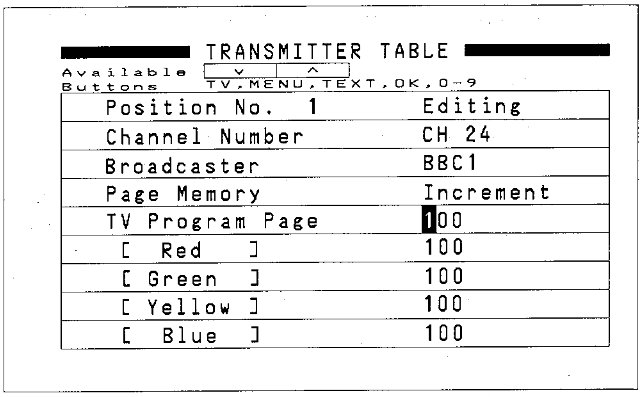
Available Buttons [v | ^ | < | >] TV,MENU,TEXT,OK

Position No. 1	Editing
Channel Number	CH 24
Broadcaster	BBC1
Page Memory	TOP
TV Program Page	100
[Red]	---
[Green]	---
[Yellow]	---
[Blue]	---

(8) The cursor will be displayed at the "TV Program Page" line page input position.

↓

Enter the page number to be selected when pressing the "VPT" key in the TV (including OSD) and menu modes.



TRANSMITTER TABLE

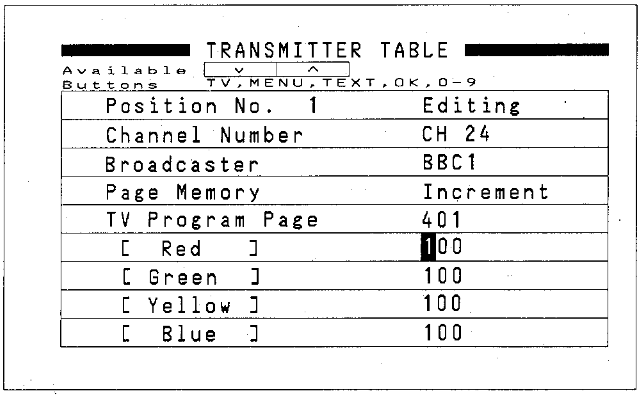
Available Buttons [v | ^] TV,MENU,TEXT,OK,0-9

Position No. 1	Editing
Channel Number	CH 24
Broadcaster	BBC1
Page Memory	Increment
TV Program Page	100
[Red]	100
[Green]	100
[Yellow]	100
[Blue]	100

(9) The cursor will be displayed at the "[Red]" line page input position.

↓

Enter the page number to be selected when pressing the "red (◀)" key.



TRANSMITTER TABLE

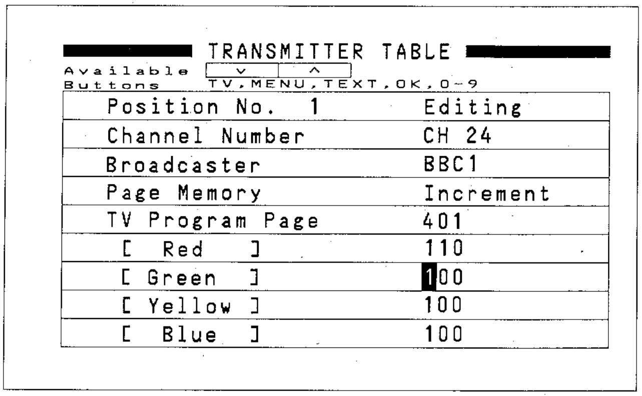
Available Buttons [v | ^] TV,MENU,TEXT,OK,0-9

Position No. 1	Editing
Channel Number	CH 24
Broadcaster	BBC1
Page Memory	Increment
TV Program Page	401
[Red]	100
[Green]	100
[Yellow]	100
[Blue]	100

(10) The cursor will be displayed at the "[Green]" line page input position.

↓

Enter the page number to be selected when pressing the "green (▲)" key.



TRANSMITTER TABLE

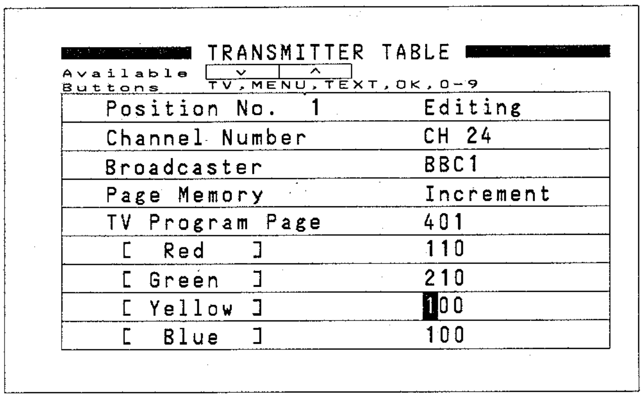
Available Buttons [v | ^] TV,MENU,TEXT,OK,0-9

Position No. 1	Editing
Channel Number	CH 24
Broadcaster	BBC1
Page Memory	Increment
TV Program Page	401
[Red]	110
[Green]	100
[Yellow]	100
[Blue]	100

(11) The cursor will be displayed at the "[Yellow]" line page input position.

↓

Enter the page number to be selected when pressing the "yellow (▶)" key.



TRANSMITTER TABLE

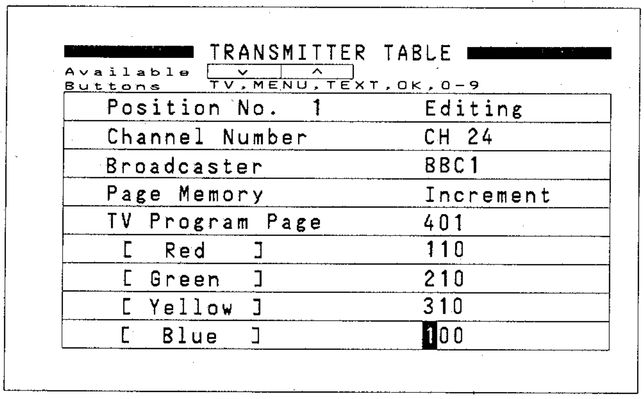
Available Buttons ∨ ∧ TV, MENU, TEXT, OK, 0−9

Position No. 1	Editing
Channel Number	CH 24
Broadcaster	BBC1
Page Memory	Increment
TV Program Page	401
[Red]	110
[Green]	210
[Yellow]	100
[Blue]	100

(12) The cursor will be displayed at the "[Blue]" line page input position.

↓

Enter the page number to be selected when pressing the "blue (▼)" key.



TRANSMITTER TABLE

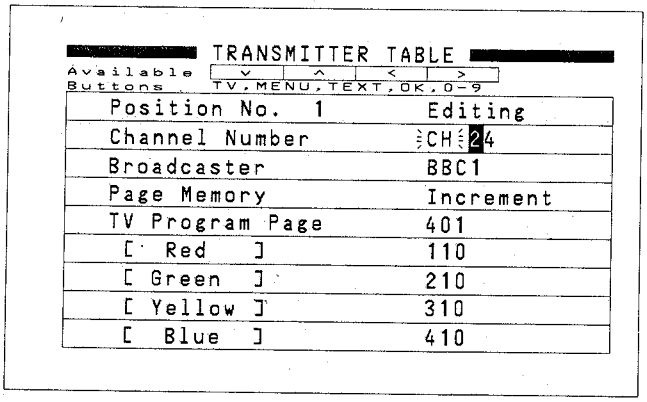
Available Buttons ∨ ∧ TV, MENU, TEXT, OK, 0−9

Position No. 1	Editing
Channel Number	CH 24
Broadcaster	BBC1
Page Memory	Increment
TV Program Page	401
[Red]	110
[Green]	210
[Yellow]	310
[Blue]	100

(13) The cursor will return to the "Channel Number" line.

↓

Press the "OK" key.

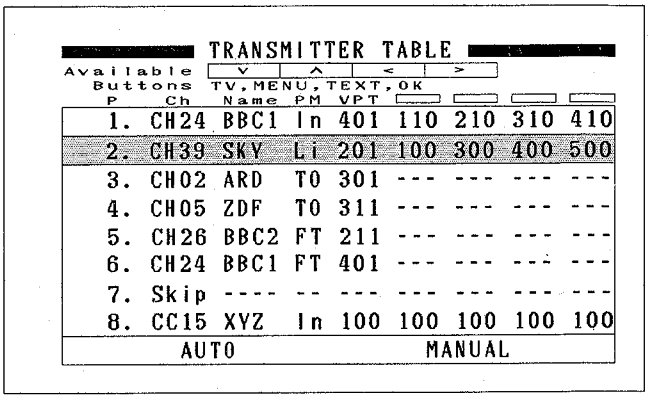


TRANSMITTER TABLE

Available Buttons ∨ ∧ < > TV, MENU, TEXT, OK, 0−9

Position No. 1	Editing
Channel Number	CH 24
Broadcaster	BBC1
Page Memory	Increment
TV Program Page	401
[Red]	110
[Green]	210
[Yellow]	310
[Blue]	410

(14) The settings will be confirmed, and the general table will be displayed again. The cursor will appear at the position next to the one just set.



TRANSMITTER TABLE

Available Buttons ∨ ∧ < > TV, MENU, TEXT, OK

P	Ch	Name	PM	VPT				
1.	CH24	BBC1	In	401	110	210	310	410
2.	CH39	SKY	Li	201	100	300	400	500
3.	CH02	ARD	TO	301	---	---	---	---
4.	CH05	ZDF	TO	311	---	---	---	---
5.	CH26	BBC2	FT	211	---	---	---	---
6.	CH24	BBC1	FT	401	---	---	---	---
7.	Skip	----	--	---	---	---	---	---
8.	CC15	XYZ	In	100	100	100	100	100

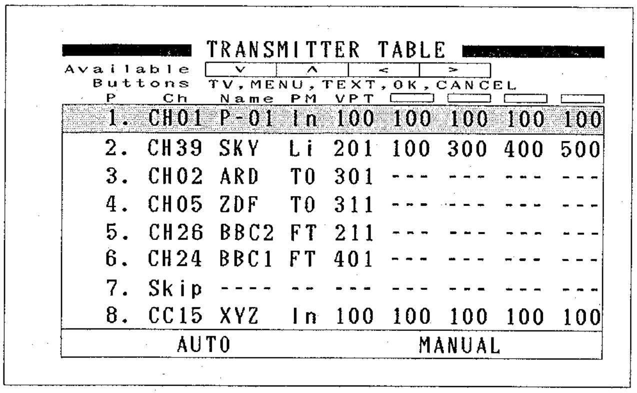
AUTO MANUAL

* To change settings partially, use the "▼" and "▲" keys to move the cursor to the item (s) you want to modify.

* To confirm the settings, the "OK" key should always be pressed at the setting page. This can be done regardless of the cursor position, except during station name editing and number input.

3. Transmitter Table Auto Sorting by VPS Code

(1) Sort in the transmitter table list on the display screen.

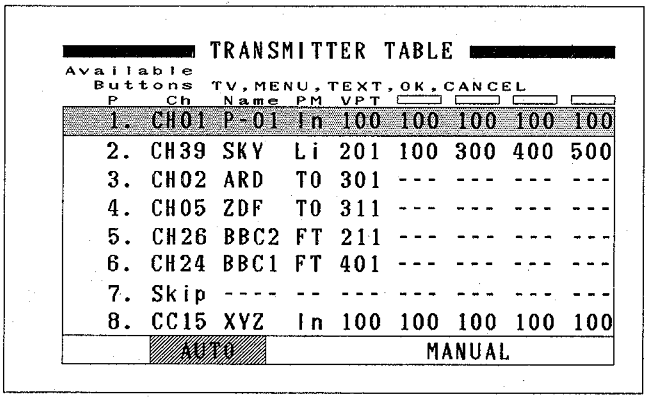


```
TRANSMITTER TABLE
Available  [ v | ^ | < | > ]
  Buttons  TV,MENU,TEXT,OK,CANCEL
  P    Ch   Name  PM  VPT
  1. CH01 P-01 In  100 100 100 100 100
  2. CH39 SKY  Li  201 100 300 400 500
  3. CH02 ARD  TO  301 --- --- --- ---
  4. CH05 ZDF  TO  311 --- --- --- ---
  5. CH26 BBC2 FT  211 --- --- --- ---
  6. CH24 BBC1 FT  401 --- --- --- ---
  7. Skip ---- --  --- --- --- --- ---
  8. CC15 XYZ  In  100 100 100 100 100
        AUTO              MANUAL
```

(2) Press "CANCEL" key while transmitter table list is displayed. This will change the sorting mode to ;

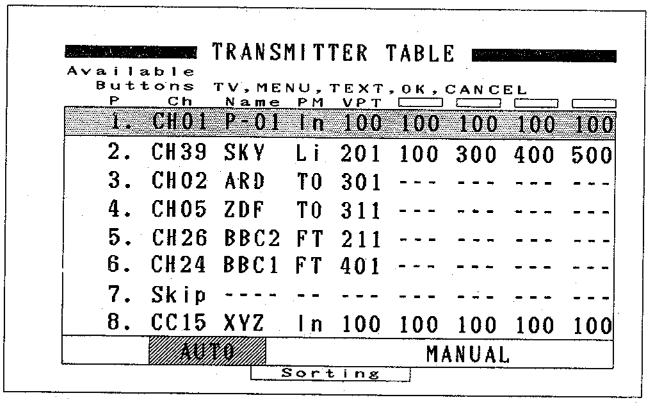
NORMAL→AUTO→MANUAL

When the mode is in AUTO or MANUAL at this time, the cursor is displayed in the display position of "AUTO", "MANUAL" at the bottom row.



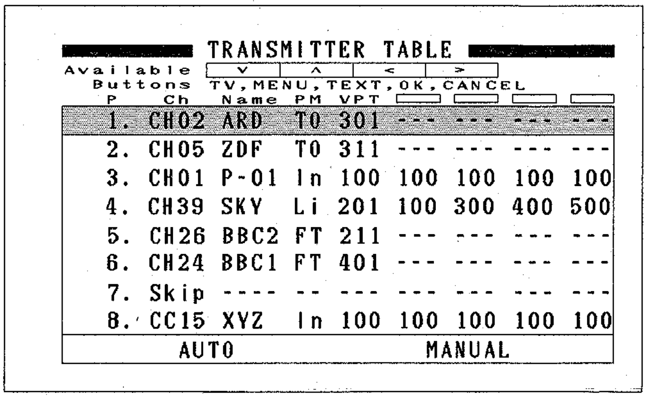
```
TRANSMITTER TABLE
Available
  Buttons  TV,MENU,TEXT,OK,CANCEL
  P    Ch   Name  PM  VPT
  1. CH01 P-01 In  100 100 100 100 100
  2. CH39 SKY  Li  201 100 300 400 500
  3. CH02 ARD  TO  301 --- --- --- ---
  4. CH05 ZDF  TO  311 --- --- --- ---
  5. CH26 BBC2 FT  211 --- --- --- ---
  6. CH24 BBC1 FT  401 --- --- --- ---
  7. Skip ---- --  --- --- --- --- ---
  8. CC15 XYZ  In  100 100 100 100 100
        AUTO              MANUAL
```

(3) When the "OK" key is pressed while the cursor in (2) is on "AUTO", the transmitter table is sorted in Program Source Code order and the data (position memory) is sent to the timer microprocessor. During under processing, the "Sorting" message will be displayed at the bottom row.



```
TRANSMITTER TABLE
Available
  Buttons  TV,MENU,TEXT,OK,CANCEL
  P    Ch   Name  PM  VPT
  1. CH01 P-01 In  100 100 100 100 100
  2. CH39 SKY  Li  201 100 300 400 500
  3. CH02 ARD  TO  301 --- --- --- ---
  4. CH05 ZDF  TO  311 --- --- --- ---
  5. CH26 BBC2 FT  211 --- --- --- ---
  6. CH24 BBC1 FT  401 --- --- --- ---
  7. Skip ---- --  --- --- --- --- ---
  8. CC15 XYZ  In  100 100 100 100 100
        AUTO              MANUAL
              Sorting
```

(4) When the processing in (3) is completed, a table is newly displayed, and the bottom row is cleared. The cursor is displayed at its original position.



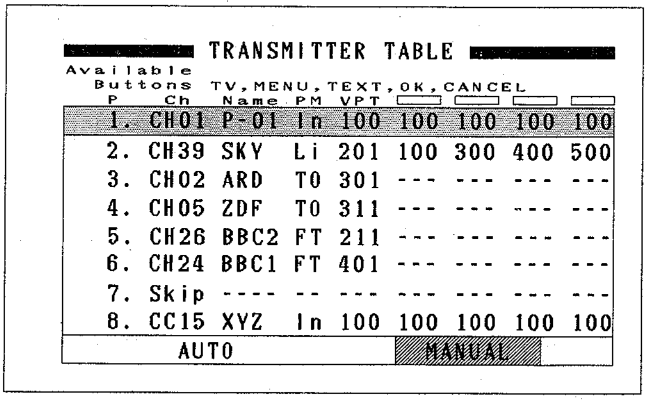
```
TRANSMITTER TABLE
Available  [ v | ^ | < | > ]
  Buttons  TV,MENU,TEXT,OK,CANCEL
  P    Ch   Name  PM  VPT
  1. CH02 ARD  TO  301 --- --- --- ---
  2. CH05 ZDF  TO  311 --- --- --- ---
  3. CH01 P-01 In  100 100 100 100 100
  4. CH39 SKY  Li  201 100 300 400 500
  5. CH26 BBC2 FT  211 --- --- --- ---
  6. CH24 BBC1 FT  401 --- --- --- ---
  7. Skip ---- --  --- --- --- --- ---
  8. CC15 XYZ  In  100 100 100 100 100
        AUTO              MANUAL
```

4. Manual Sorting of the Transmitter Table

(1) Press "CANCEL" key while transmitter table list is displayed. This will change the sorting mode to ;

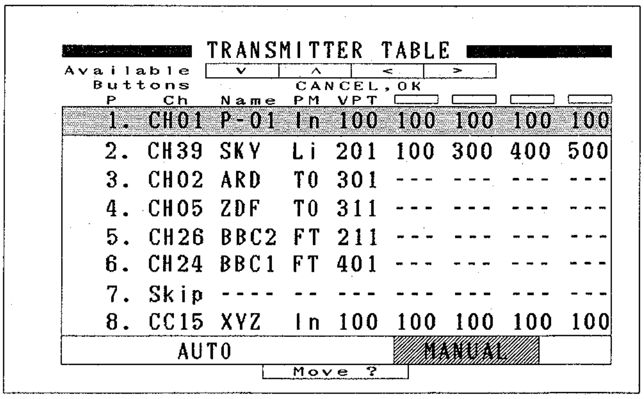
NORMAL→AUTO→MANUAL

When the mode is in AUTO or MANUAL at this time, the cursor is displayed in the display position of "AUTO", "MANUAL" at the bottom row, as in 1.



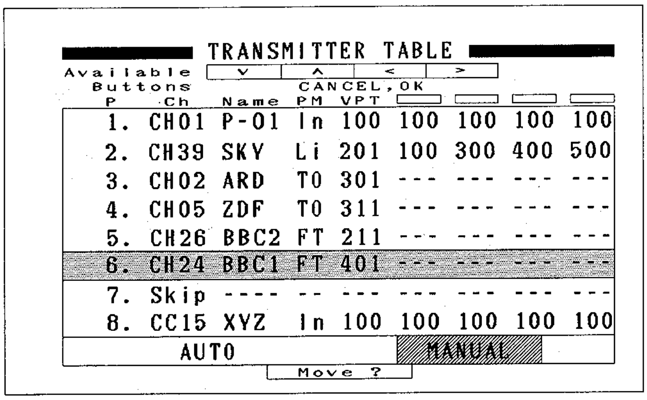
```
TRANSMITTER TABLE
Available
  Buttons  TV,MENU,TEXT,OK,CANCEL
  P    Ch   Name  PM  VPT
  1. CH01 P-01 In  100 100 100 100 100
  2. CH39 SKY  Li  201 100 300 400 500
  3. CH02 ARD  TO  301 --- --- --- ---
  4. CH05 ZDF  TO  311 --- --- --- ---
  5. CH26 BBC2 FT  211 --- --- --- ---
  6. CH24 BBC1 FT  401 --- --- --- ---
  7. Skip ---- --  --- --- --- --- ---
  8. CC15 XYZ  In  100 100 100 100 100
        AUTO              MANUAL
```

(2) When the "OK" key is pressed while the cursor is on "MANUAL", the system will enter manual sorting mode ① and the "Move" message is displayed on the bottom row.



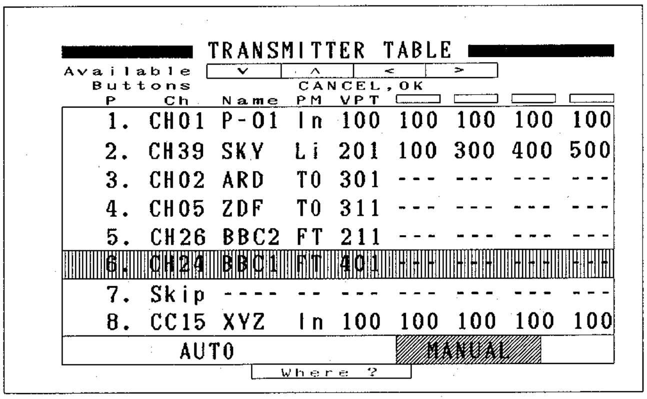
```
TRANSMITTER TABLE
Available  [ v | ^ | < | > ]
  Buttons          CANCEL,OK
  P    Ch   Name  PM  VPT
  1. CH01 P-01 In  100 100 100 100 100
  2. CH39 SKY  Li  201 100 300 400 500
  3. CH02 ARD  TO  301 --- --- --- ---
  4. CH05 ZDF  TO  311 --- --- --- ---
  5. CH26 BBC2 FT  211 --- --- --- ---
  6. CH24 BBC1 FT  401 --- --- --- ---
  7. Skip ---- --  --- --- --- --- ---
  8. CC15 XYZ  In  100 100 100 100 100
        AUTO              MANUAL
              Move ?
```

(3) Move the cursor to the required position by using the cursor keys ("◀", "▶", "▲", "▼") and press the "OK" key.



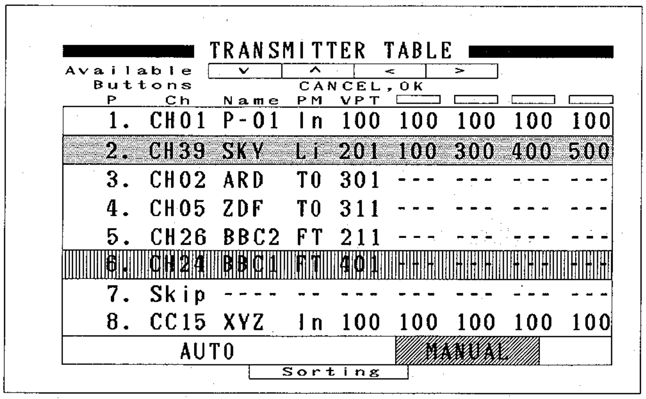
```
TRANSMITTER TABLE
Available  [ v | ^ | < | > ]
Buttons         CANCEL,OK
P   Ch   Name PM  VPT
1. CH01 P-01 In 100 100 100 100 100
2. CH39 SKY  Li 201 100 300 400 500
3. CH02 ARD  TO 301 --- --- --- ---
4. CH05 ZDF  TO 311 --- --- --- ---
5. CH26 BBC2 FT 211 --- --- --- ---
6. CH24 BBC1 FT 401 --- --- --- ---
7. Skip ---- -- --- --- --- --- ---
8. CC15 XYZ  In 100 100 100 100 100
      AUTO              MANUAL
            Move ?
```

(4) The cursor is turned to red at the selected position, and the "Where" message is displayed on the bottom row, and the manual sorting mode ② is selected.



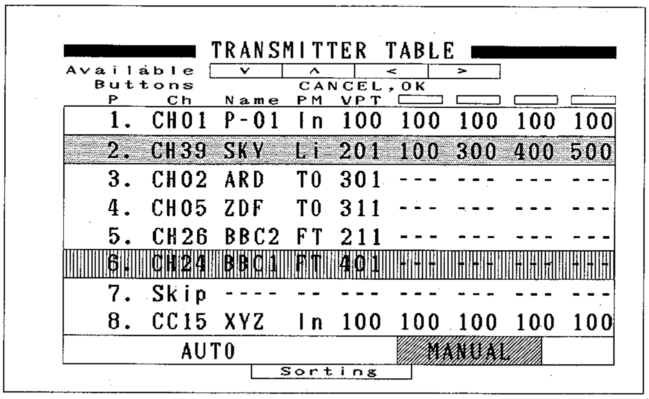
```
TRANSMITTER TABLE
Available  [ v | ^ | < | > ]
Buttons         CANCEL,OK
P   Ch   Name PM  VPT
1. CH01 P-01 In 100 100 100 100 100
2. CH39 SKY  Li 201 100 300 400 500
3. CH02 ARD  TO 301 --- --- --- ---
4. CH05 ZDF  TO 311 --- --- --- ---
5. CH26 BBC2 FT 211 --- --- --- ---
6. CH24 BBC1 FT 401 --- --- --- ---
7. Skip ---- -- --- --- --- --- ---
8. CC15 XYZ  In 100 100 100 100 100
      AUTO              MANUAL
            Where ?
```

(5) Move the cursor to the position beneath the inserting position by using the cursor keys ("◀", "▶", "▲", "▼") and press the "OK" key.



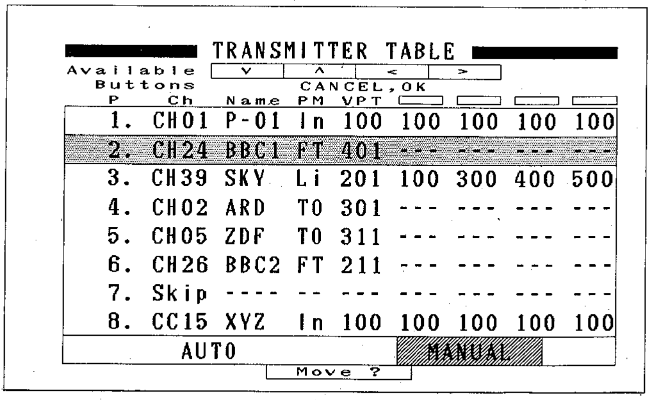
```
TRANSMITTER TABLE
Available  [ v | ^ | < | > ]
Buttons         CANCEL,OK
P   Ch   Name PM  VPT
1. CH01 P-01 In 100 100 100 100 100
2. CH39 SKY  Li 201 100 300 400 500
3. CH02 ARD  TO 301 --- --- --- ---
4. CH05 ZDF  TO 311 --- --- --- ---
5. CH26 BBC2 FT 211 --- --- --- ---
6. CH24 BBC1 FT 401 --- --- --- ---
7. Skip ---- -- --- --- --- --- ---
8. CC15 XYZ  In 100 100 100 100 100
      AUTO              MANUAL
            Sorting
```

(6) Sort the transmitter table, and send the data (position memory and position change) to the timer microprocessor. While processing, the "Now Sorting" message is displayed on the bottom row.



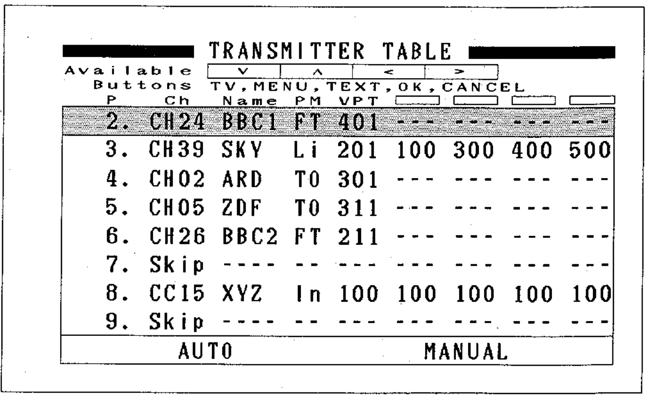
```
TRANSMITTER TABLE
Available  [ v | ^ | < | > ]
Buttons         CANCEL,OK
P   Ch   Name PM  VPT
1. CH01 P-01 In 100 100 100 100 100
2. CH39 SKY  Li 201 100 300 400 500
3. CH02 ARD  TO 301 --- --- --- ---
4. CH05 ZDF  TO 311 --- --- --- ---
5. CH26 BBC2 FT 211 --- --- --- ---
6. CH24 BBC1 FT 401 --- --- --- ---
7. Skip ---- -- --- --- --- --- ---
8. CC15 XYZ  In 100 100 100 100 100
      AUTO              MANUAL
            Sorting
```

(7) When the processing in (6) is completed, the table will be newly displayed, and return to the status in (2). The cursor is displayed on the moved position. When consecutive position sorting is required, repeat processes (2) to (7).



```
TRANSMITTER TABLE
Available  [ v | ^ | < | > ]
Buttons         CANCEL,OK
P   Ch   Name PM  VPT
1. CH01 P-01 In 100 100 100 100 100
2. CH24 BBC1 FT 401 --- --- --- ---
3. CH39 SKY  Li 201 100 300 400 500
4. CH02 ARD  TO 301 --- --- --- ---
5. CH05 ZDF  TO 311 --- --- --- ---
6. CH26 BBC2 FT 211 --- --- --- ---
7. Skip ---- -- --- --- --- --- ---
8. CC15 XYZ  In 100 100 100 100 100
      AUTO              MANUAL
            Move ?
```

(8) Press "CANCEL" key to terminate the mode of manual sorting, and return to status in (1). The table is re-displayed so that the cursor position comes to the foremost row.

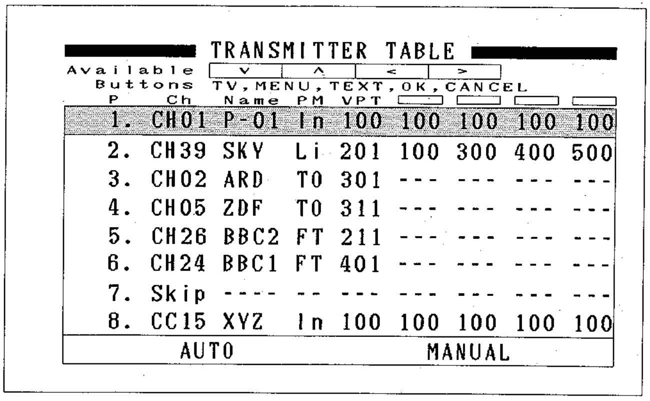


```
TRANSMITTER TABLE
Available  [ v | ^ | < | > ]
Buttons    TV,MENU,TEXT,OK,CANCEL
P   Ch   Name PM  VPT
2. CH24 BBC1 FT 401 --- --- --- ---
3. CH39 SKY  Li 201 100 300 400 500
4. CH02 ARD  TO 301 --- --- --- ---
5. CH05 ZDF  TO 311 --- --- --- ---
6. CH26 BBC2 FT 211 --- --- --- ---
7. Skip ---- -- --- --- --- --- ---
8. CC15 XYZ  In 100 100 100 100 100
9. Skip ---- -- --- --- --- --- ---
      AUTO              MANUAL
```

* The position change data is not transmitted to the timer microprocessor in (3) to (5). The data (position memory and position change) is transmitted there only when the process reaches (6).

5. Auto Writing of Station Name by VPS Code

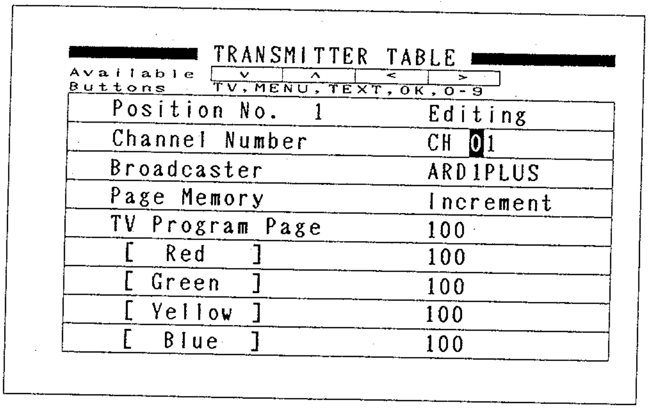
(1) Receive a VPS code of its position, when entering edit screen from table list in the transmitter table editing. If the code exists, a station name is automatically written in.



```
TRANSMITTER TABLE
Available  [ v | ^ | < | > ]
  Buttons  TV,MENU,TEXT,OK,CANCEL
  P    Ch   Name PM  VPT
  1. CH01 P-01 In 100 100 100 100 100
  2. CH39 SKY  Li 201 100 300 400 500
  3. CH02 ARD  TO 301 --- --- --- ---
  4. CH05 ZDF  TO 311 --- --- --- ---
  5. CH26 BBC2 FT 211 --- --- --- ---
  6. CH24 BBC1 FT 401 --- --- --- ---
  7. Skip ---- -- --- --- --- --- ---
  8. CC15 XYZ  In 100 100 100 100 100
        AUTO              MANUAL
```

↓

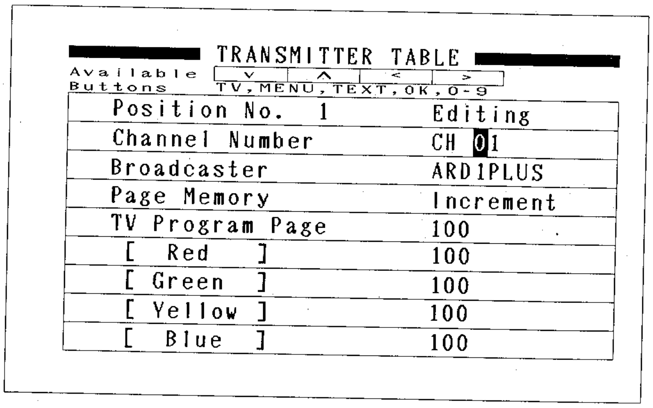
Press the "OK" key.



```
TRANSMITTER TABLE
Available  [ v | ^ | < | > ]
Buttons    TV,MENU,TEXT,OK,0-9
  Position No.  1       Editing
  Channel Number        CH 01
  Broadcaster           ARD1PLUS
  Page Memory           Increment
  TV Program Page       100
   [  Red    ]          100
   [ Green   ]          100
   [ Yellow  ]          100
   [  Blue   ]          100
```

* Receive a VPS code. If the code exists, a station name is written in (ARK1PLUS). When there is no VPS code or no station name to correspond, the status will remain unchanged.

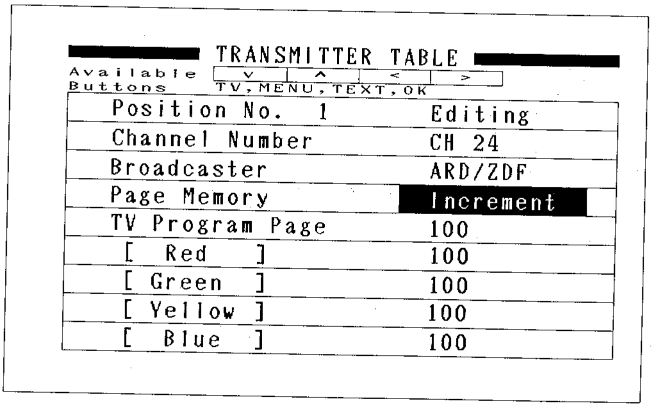
(2) Input a channel number of two figures, and receive a VPS code in the transmitter table editing. If the code exists, a station name is automatically written in.



```
TRANSMITTER TABLE
Available  [ v | ^ | < | > ]
Buttons    TV,MENU,TEXT,OK,0-9
  Position No.  1       Editing
  Channel Number        CH 01
  Broadcaster           ARD1PLUS
  Page Memory           Increment
  TV Program Page       100
   [  Red    ]          100
   [ Green   ]          100
   [ Yellow  ]          100
   [  Blue   ]          100
```

↓

Press the "2", "4" key.



```
TRANSMITTER TABLE
Available  [ v | ^ | < | > ]
Buttons    TV,MENU,TEXT,OK
  Position No.  1       Editing
  Channel Number        CH 24
  Broadcaster           ARD/ZDF
  Page Memory           Increment
  TV Program Page       100
   [  Red    ]          100
   [ Green   ]          100
   [ Yellow  ]          100
   [  Blue   ]          100
```

* Receive a VPS code. If the code exists, a station name is written in (ARD/ZDF). When there is no VPS code or no station name to correspond, the status will remain unchanged and the cursor is positioned at the station name.

6. Timer Programming

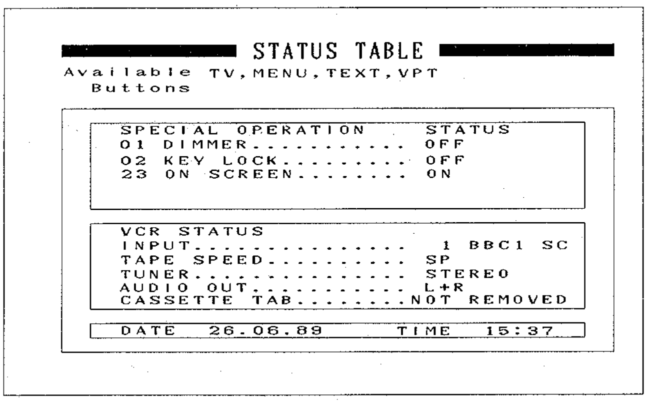
Refer to section 2-4-2. Timer Programming.

7. Status Table

This function is used to display the VCR's present condition, the day and the time on the TV screen. Shown VCR data are :

(1) Special Function ON/OFF :
DIMMER, KEY LOCK, ON SCREEN
(2) Input Condition :
Position, station name, simulcast ON/OFF
(3) Tape Speed : SP/LP
(4) Tuner Condition : STEREO/BILINGUAL/MONO
(5) Audio Output Condition :
L + R/LEFT/RIGHT/MONO
(6) Cassette Condition :
Cassette loaded/not loaded, erase prevention tab not removed/removed.

To access this page, enter 2 at the menu page to select "STATUS TABLE".

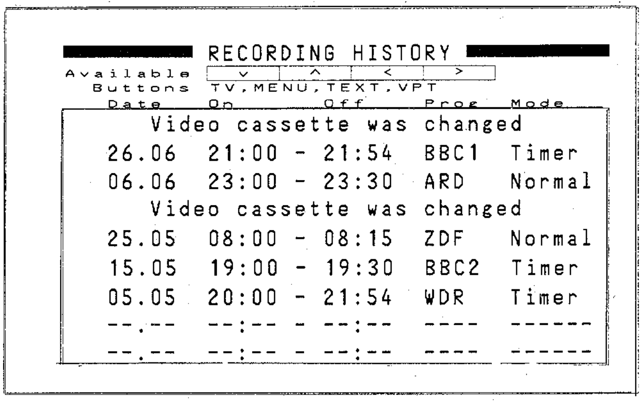


```
STATUS TABLE
Available  TV,MENU,TEXT,VPT
  Buttons

SPECIAL OPERATION      STATUS
01 DIMMER...........   OFF
02 KEY LOCK.........   OFF
23 ON SCREEN........   ON

VCR STATUS
INPUT...............    1 BBC1 SC
TAPE SPEED..........   SP
TUNER...............   STEREO
AUDIO OUT...........   L+R
CASSETTE TAB........NOT REMOVED

DATE  26.06.89        TIME  15:37
```

8. Recording History

This function memorizes and displays on the TV screen the last 20 programs recorded, including recording date, position and mode (timer recording or manual recording). More recent programs are displayed first. If the cassette has been inserted or ejected, the "Video cassette was changed" message is displayed. The number of memorized programs decreases by one for each one of these messages displayed. To access this page, enter 4 at the menu page to select "RECORDING HISTORY".

* Functions of the "▼", "▲", "◀" and "▶" keys
"▼" : Scroll up one line
"▲" : Scroll down one line
"◀" : Scroll down one page
"▶" : Scroll up one page



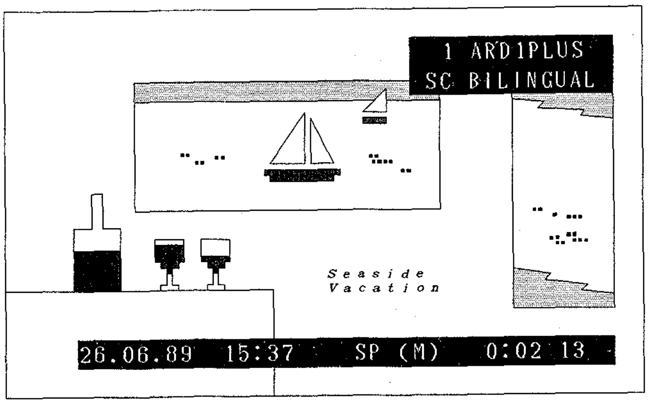
```
RECORDING HISTORY
Available  [ v | ^ | < | > ]
  Buttons  TV,MENU,TEXT,VPT
  Date   On       Off     Prog  Mode
     Video cassette was changed
  26.06  21:00 - 21:54  BBC1  Timer
  06.06  23:00 - 23:30  ARD   Normal
     Video cassette was changed
  25.05  08:00 - 08:15  ZDF   Normal
  15.05  19:00 - 19:30  BBC2  Timer
  05.05  20:00 - 21:54  WDR   Timer
  --.--  --:-- - --:--  ----  ------
  --.--  --:-- - --:--  ----  ------
```

2-4. OSD FUNCTION

This function displays the current VCR condition, the date and the time superimposed to the TV picture in the TV mode. Shown VCR data are :

(1) Input Condition : Position , station name , simulcast ON (SC indication) / OFF (no indication)
(2) Tuner Audio Condition : STEREO/BILINGUAL/ MONO (no indication)
(3) Tape Speed : SP/LP
(4) Counter Memory : ON ((M) indication) /OFF (no indication)
(5) Counter or Remaining Tape

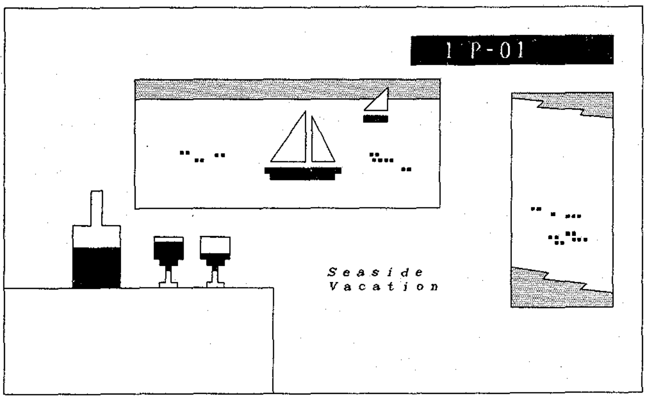
To obtain the OSD information, press the "STATUS" key in the TV mode. To cancel the display, press "STATUS" key again.


1 ARD1PLUS
SC BILINGUAL
Seaside Vacation
26.06.89 15:37 SP (M) 0:02 13

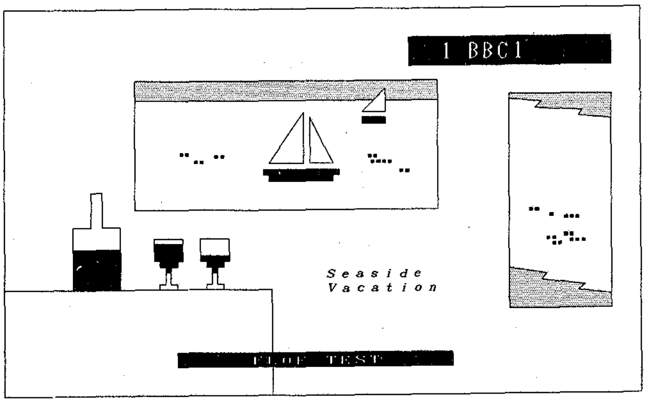
2-5. AUTOMATIC WRITE-IN OF STATION NAME BY THE FLOF PACKET 8/30

The station name is automatically written during normal TV monitoring, only when the FLOF is set under page memory mode.

Example :
When the position is changed by moving the channel UP/DOWN keys, the position OSD is displayed. When the FLOF mode is set in the page memory mode of that position, and a text broadcasting by FLOP is received, the FLOF packet 8/30 displays automatically written station name through OSD, simultaneously with the status display after the analysis.


1 P-01
Seaside Vacation

↓


1 BBC1
Seaside Vacation
FLOF TEST

＊ Priority Order of Station Name Writing Method
Following three methods are available for writing the station name ;

① Manual input when editing the transmitter table.
② Automatic writing by VPS code.
③ Automatic writing by FLOF packet 8／30.

The following strength (priority) is set to these methods.

Strong ① → ② → ③ Weak

When a station name is already written in by strongest method ①, writing in will not be executed by weaker methods than it. Also, writing in at same level will not be executed through method ② or ③, either.

Station name writing in method	Write-in method already executed			
	Unwritten	①	②	③
①	Possible	Possible	Possible	Possible
②	Possible	Impossible	Impossible	Possible
③	Possible	Impossible	Impossible	Impossible

However, when a number of two figures of channel is input while editing the transmitter table, the write-in history of the station name is reset, and any method of ① to ③ is valid.

2-6. HIDDEN FUNCTION

Changing the Display Timing of the Sync Signal from CCT

Text pages are displayed by sync signals supplied from CCT. Differences in the display timing of these signals may cause vertical image vibration. The noninterlaced 312／313-line setting produces no vibration in most cases, but the interlaced 312／313-line setting is better for some TVs. This system allows for changing the display timing. Simply enter "0980" with the numerical keys at the menu page. Repeating the same procedure will restore the original setting. To confirm the display timing setting, check whether there is vertical image vibration.

＊ The default setting for display timing is 312／313 lines, noninterlaced.

9. INFRARED REMOTE SOUND SYSTEM CIRCUIT

1. OUTLINE

1-1. SYSTEM CONFIGURATION

This IR Sound System is to convert the same signal, that is output from the AUDIO LINE OUT terminal, into light (infrared rays) signal by the VTR's built-in transmitter, and to transmit the light signal, so that it can be received by the separate infrared sound receiver unit. The audio output signal can thus be monitored by a headphone that is plugged into HEADPHONE jack on the sound receiver unit. The IR Sound System is the remote sound monitoring system.

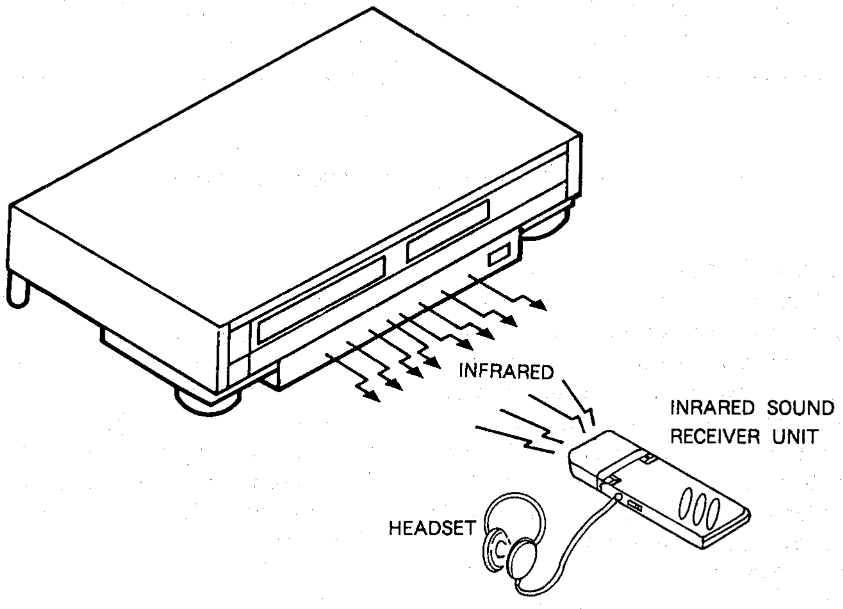


Fig. 1. IR Sound System

1-2. SPECIFICATIONS

The light (infrared rays) signal that is transmitted from the VTR and received by sound reciver unit has the following specifications.

- Transmission system :
  Infrared rays FM stereo dual wave transmission system
- Infrared rays radiation wavelength :
  950 nm (maximum radiation wavelength)
- Infrared rays reception wavelength :
  950 nm(maximum receiving sensitivity wavelength)
- Carrier frequencies :
  L channel 95 kHz
  R channel 250 kHz
- Maximum frequency deviation :
  Both L/R channels ± 50 kHz
- Emphasis :
  Both L/R channels 50 μsec.

2. CIRCUIT DESCRIPTION

2-1. TRANSMITTER

Block diagram of transmitter that is built-in inside VTR, is shown in Fig. 2. Each circuits of the block diagram are discussed as follows.

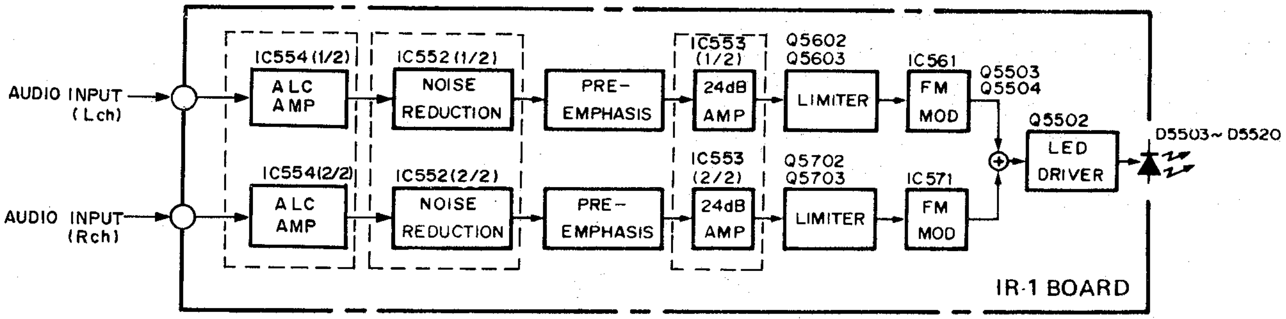

AUDIO INPUT (Lch)
AUDIO INPUT (Rch)
IC554(1/2)
ALC AMP
IC552(1/2)
NOISE REDUCTION
PRE-EMPHASIS
IC553 (1/2)
24dB AMP
Q5602
Q5603
LIMITER
IC561
FM MOD
Q5503
Q5504
Q5502
LED DRIVER
D5503~D5520
IC554(2/2)
ALC AMP
IC552(2/2)
NOISE REDUCTION
PRE-EMPHASIS
IC553 (2/2)
24dB AMP
Q5702
Q5703
LIMITER
IC571
FM MOD
IR-1 BOARD

Fig. 2. Transmitter Block Diagram

2-1-1. Noise Reduction Circuit

Signal processing of noise reduction is realized by IC552, that reduces very effectively the optical random noise which is generated in transmission between transmitter (VTR) and receiver (remote control unit). When random noise as much as −40 dB is generated between transmitter (VTR) and receiver (remote control unit), for example, resultant noise level at receiver's headphone output jack is reduced to −80 dB by use of this noise reduction system, as shown in Fig. 3.

This noise reduction system is first to compress the audio signal level by half in logarithmic compression ratio during transmission at transmitter. The receiving signal is expanded by two times at receiver in logarithmic expansion ratio so that original signal level is restored. The logarithmic compression and expansion are processed with the reference signal level of 20 mV (−31.8 dBs) as 0 dB.

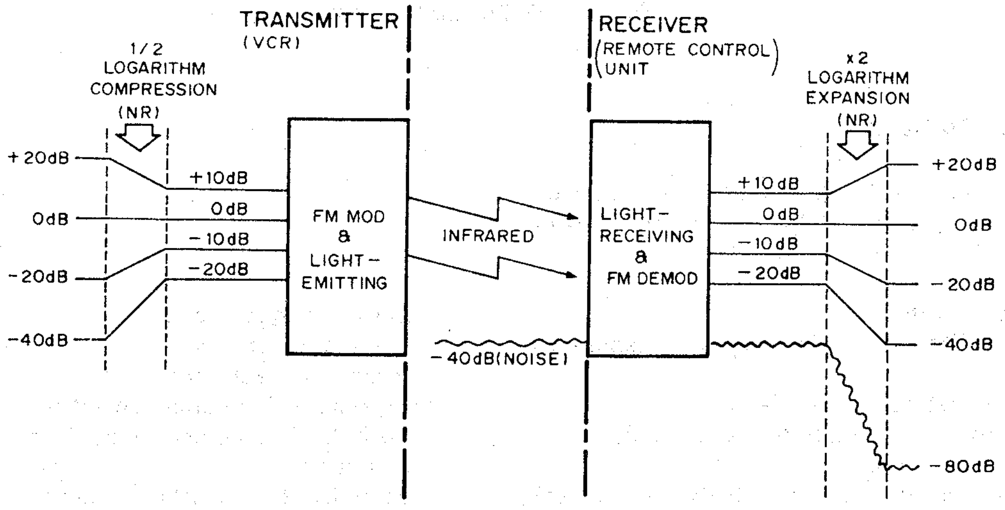

TRANSMITTER (VCR)
1/2 LOGARITHM COMPRESSION (NR)
+20dB
0dB
−20dB
−40dB
+10dB
0dB
−10dB
−20dB
FM MOD & LIGHT-EMITTING
INFRARED
−40dB(NOISE)
RECEIVER (REMOTE CONTROL UNIT)
LIGHT-RECEIVING & FM DEMOD
+10dB
0dB
−10dB
−20dB
x2 LOGARITHM EXPANSION (NR)
+20dB
0dB
−20dB
−40dB
−80dB

Fig. 3. Noise Reduction System

2-1-2. Preemphasis Circuit

The preemphasis circuit provides the frequency emphasis characteristics that conforms to 50 μsec theoretical characteristics, as shown in Fig. 4, to the signal to be transmitted. The signal that is received by the receiver, is corrected by the de-emphasis circuit in the reverse characteristics (Fig. 6) of Fig. 4 characteristics.

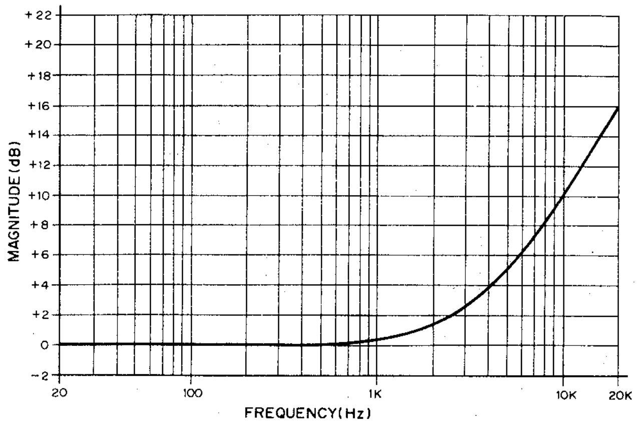


Fig. 4. Preemphasis Characteristics

2-1-3. Audio Amplifier

The audio amplifier IC553 amplifies the preemphasized signal by approximately 24 dB in order to supply the audio signal to FM modulator with enough amplitude.

2-1-4. Limiter

The circuits of Q5602 and Q5603 form amplitude limiter circuit for L-channel signal. The circuits of Q5702 and Q5703 form amplitude limiter circuit for R-channel signal. These amplitude limiter circuits limit amplitude of the input signals to be fed to L-channel FM modulator (IC561) and R-channel FM modulator (IC571), so as to prevent over-modulation.

2-1-5. FM Modulator

The VCO (Voltage Controlled Oscillator) IC561 is L-channel FM modulator and the VCO IC571 is R-channel FM modulator that oscillate at the frequencies proportional to input signal voltage. The L-channel VCO oscillates at the center frequency of 95 kHz and the R-channel VCO oscillates at the center frequency of 250 kHz.

Fig. 5 shows the output frequency vs input voltage characteristics of L-channel and R-channel. Amount of frequency deviation is approximately ± 30 kHz when the signal of f = 1 kHz/ − 4.4 dBs is input. The frequency deviation at limiter's saturation (i.e. maximum frequency deviation) is approximately ± 50 kHz.

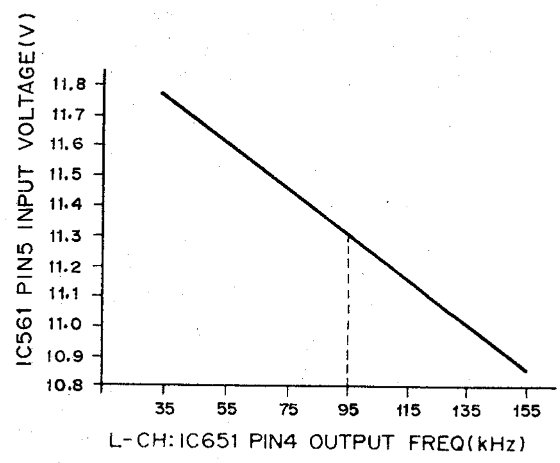


Fig. 5 (a). L-channel Input Voltage vs Output Frequency Characteristics

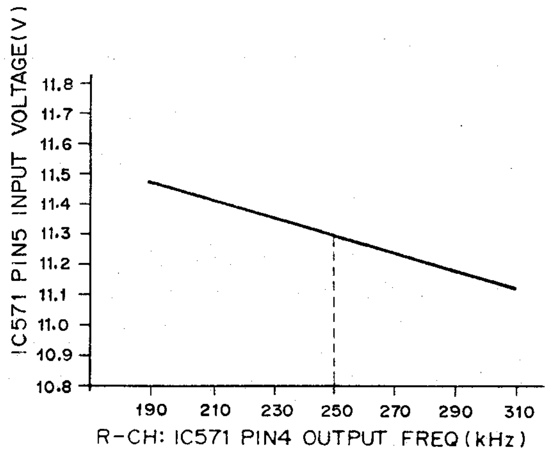


Fig. 5 (b). R-channel Input Voltage vs Output Frequency Characteristics

2-1-6. L/R-channels Mixing Amplifier and LED Driver

The mixing amplifier consists of Q5503 and Q5504 that mixes the L-channel signal and R-channel signal which have already been FM modulated. The mixed signal is sent to LED driver circuit of Q5502, and enough current is flown through LED in order to radiate infrared rays from LEDs.

2-1-7. Infrared LED

Mixed signal of two carrier frequencies of 95 kHz and 250 kHz, is radiated in the form of infrared rays from 18 LEDs of D5503 through D5520. The infrared rays of 950 nm ± 70 nm wavelength (maximum radiated wavelength 950 nm) is radiated from these LEDs.

2-2. RECEIVER

Block diagram of the built-in receiver in the remote control unit, is shown in Fig. 6. Each circuits of the block diagram are described as follows.

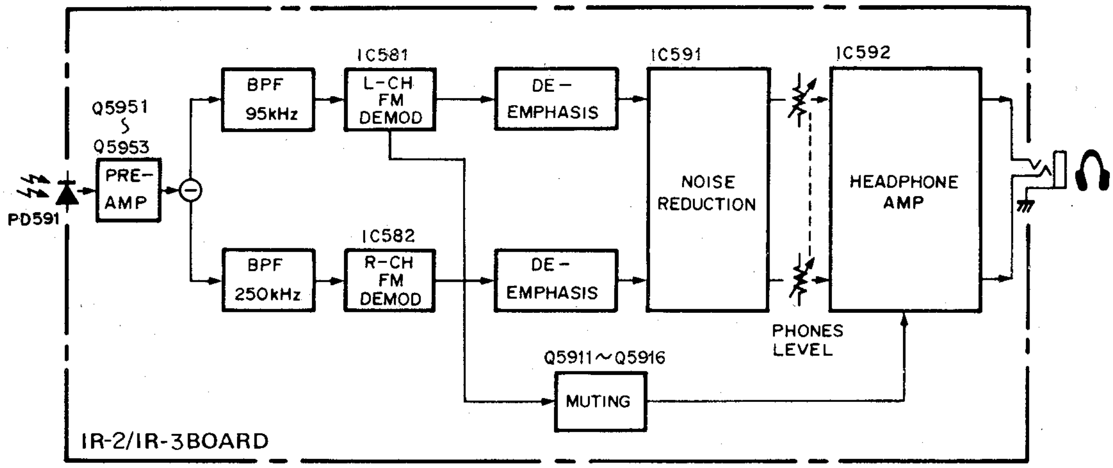

Q5951
∫
Q5953
PRE-AMP
PD591
BPF 95kHz
IC581
L-CH FM DEMOD
BPF 250kHz
IC582
R-CH FM DEMOD
DE-EMPHASIS
DE-EMPHASIS
IC591
NOISE REDUCTION
IC592
HEADPHONE AMP
PHONES LEVEL
Q5911~Q5916
MUTING
IR-2/IR-3BOARD

Fig. 6. Receiver Block Diagram

2-2-1. Receiving Block's Sensor (PD591)

PIN type diode equipped with condenser lens, is employed as infrared rays sensor (PD591). In order to cut-off visible light of less than 760 nm wavelength, dyestuff is enclosed in PIN photo-diode.

2-2-2. Preamplifier

Preamplifier consists of Q5951, Q5952 and Q5953 that amplify the receiving infrared rays through sensor (PD591), by approximately 35 dB.

2-2-3. Bandpass Filter

From the infrared sensor to preamplifier circuit, the L-channel FM modulated signal of 95 kHz carrier frequency and the R-channel FM modulated signal of 250 kHz carrier frequency are mixed and existing together. Bandpass filters are used to extract the L-channel FM signal and the R-channel FM signal from the mixed FM modulated carriers. Bandpass filter characteristics are shown in Fig. 7.

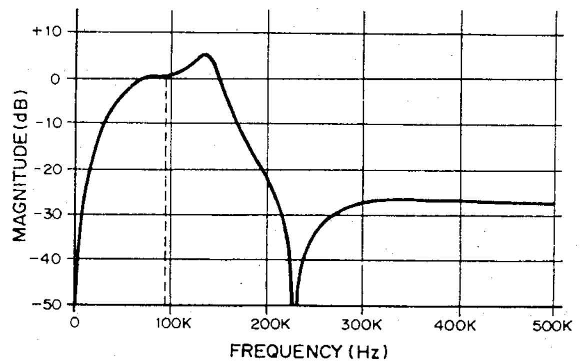


Fig. 7 (a). L-channel (95 kHz) BPF Frequency Response

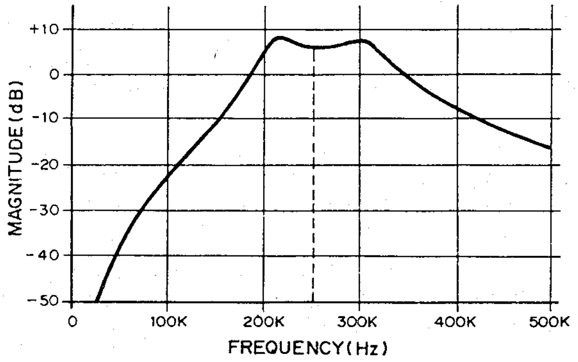


Fig. 7 (b). R-channel (250 kHz) BPF Frequency Response

2-2-4. FM Demodulator

The L-channel and R-channel FM modulated signals that are extracted by the afore-mentioned bandpass filters, are sent to IC581 and IC582 where the L-channel 95 kHz FM signal is demodulated by IC581 and the R-channel 250 kHz FM signal is demodulated by IC582.

2-2-5. De-emphasis Circuit

The preemphasized signal from transmitter is de-emphasized by the de-emphasis circuit to restore original characteristics. It provides the required de-emphasis characteristics that is equal to 50 µsec theoretical characteristics to the demodulated signal, as shown in Fig. 8.

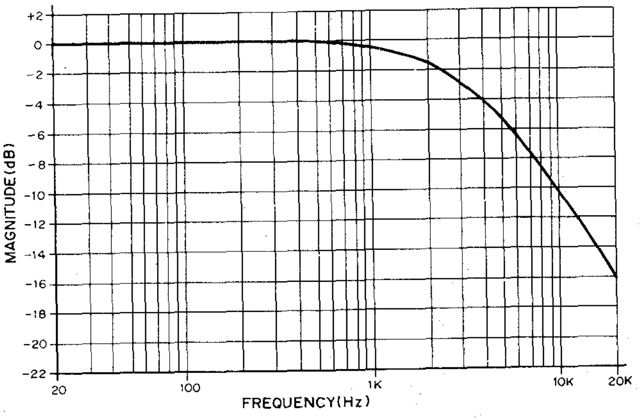


Fig. 8. De-emphasis Characteristics

2-2-6. Noise Reduction Circuit

The noise reduction circuit consists of IC591 that expands the transmitted audio signal level by two times in logarithmic expansion ratio where the audio signal has been compressed by 1／2 time in transmitter (VTR end). The original audio level is thus restored. Thus, the optical random noise that is generated between transmitter (VTR) and receiver (remote control unit) is suppressed.

2-2-7. Muting Circuit

Muting circuit consists of Q5911 through Q5916 and functions in the following occasions.

[When enough amount of infrared rays (FM modulated signal) cannot be received.]

In such cases when power of transmitter (VTR) is set to OFF, or when receiver is placed outside the receivable range, or when obstacle is placed between transmitter and receiver, the infrared rays from transmitter cannot be received. In these cases, pulse-shaped noise is generated from pin 8 of IC581. The generated noise is buffered by Q5911, amplified by Q5912 and puts Q5913 into ON state. As the result, collector of Q5916 becomes "L" level and the pin 10 of headphone amplifier IC592 are set to "L" level that mute audio output signal.

3. IR SOUND SYSTEM TRANSMISSION/RECEPTION CAPABILITY

3-1. RECEPTION RANGE

VTR transmits infrared rays in the ±20° range, as shown in Fig. 9, when there is not reflection. Sound receiver unit has the infrared rays reception range of ±60°. The effective distance between VTR and sound receiver unit is within 7m.

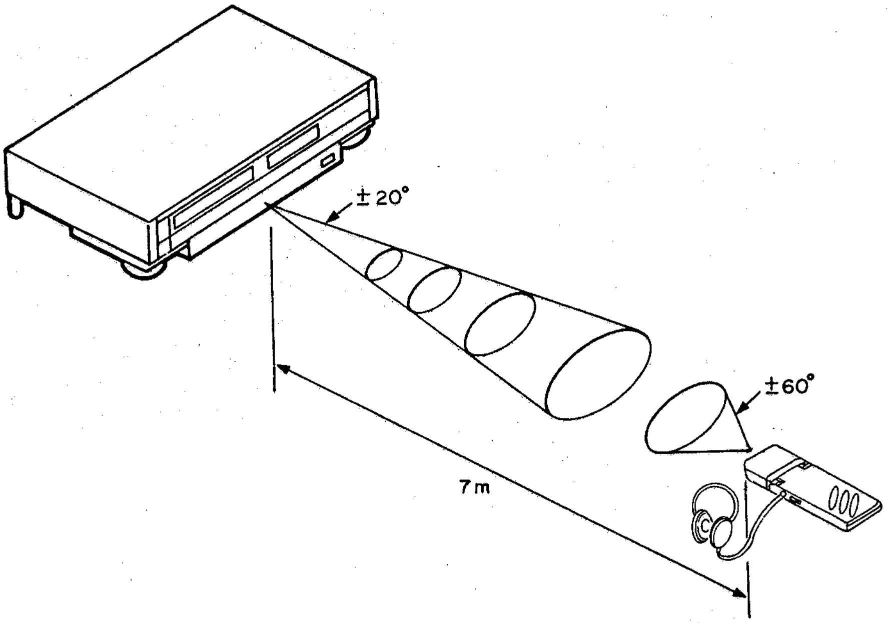


Fig. 9. Reception Range in Case of No Reflection

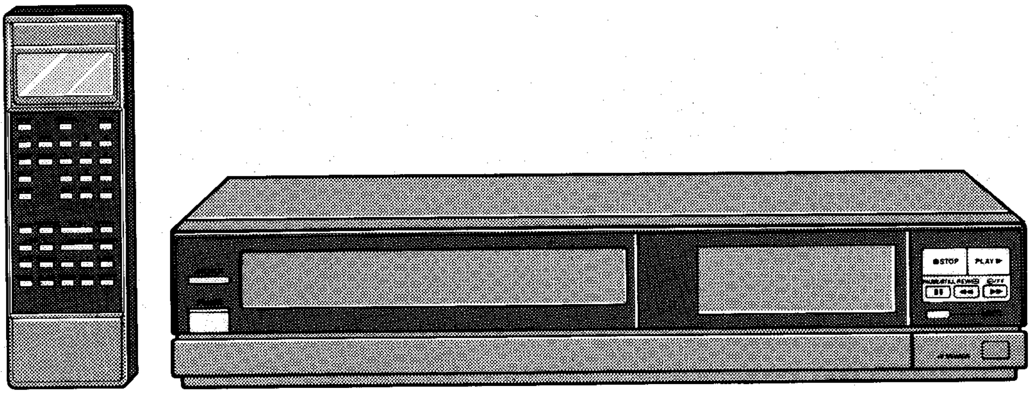
In practice, infrared rays are reflected by wall, ceiling, floor, furnitures, human body, etc. Therefore audible range is affected by size of a room and layout furnitures. When room size is smaller and wall color is whitish, reflection is increased so that audible range becomes wider.

SANYO

Parts List & Circuit Diagrams

Video Cassette Recorder

VHR-7500G (West Germany)
VHR-7540G (West Germany)
VHR-7530G (West Germany)
VHR-7500EX (Europe)
VHR-8500SP (Spain)


EXCEPT VHR-7540G

VHS PAL HQ

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COMPL, VP-1 11
COMPL, SY-7 12
COMPL, PW-1 12
COMPL, PW-2 13
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COMPL, TM-2 16
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COMPL, TM-8 17
COMPL, TB-1 17
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Circuit Diagram

Please see other materials with Reference No. given in table below.

Materials	Model No.	Reference No.
Service Manual	VHR-7500, 8500 Series	WM-530660
Mechanism Manual	P90 Mechanism	WM-530599

PRODUCT SAFETY NOTICE

The components designated by a symbol (⚠) in this schematic diagram designates components whose value are of special significance to product safety. Should any component designated by a symbol need to be replaced, use only the part designated in the Parts List. Do not deviate from the resistance, wattage and voltage ratings shown.

NOTE: 1. Parts order must contain Model Number, Part Number and Description.
2. N.S.P.: Not available as service parts.

RP4/G-C1F, RP4V/G-C1F	143 810 16, 09
RP4/G-2, EX, SP	143 130 25, 125 80, 81

REFERENCE No. WM-530661

ACCESSORIES

LOCATION		PARTS NO.	DESCRIPTION
		613 112 7883	REMOCON(VHR-7500G,7530G)
OR		613 111 8270	REMOCON(VHR-7540G)
OR		613 111 4210	REMOCON(VHR-7500EX,8500SP)
		613 115 1642	INSTRUCTION MANUAL(VHR-7500G)
OR		613 115 3684	INSTRUCTION MANUAL(VHR-7540G)
OR		613 114 0134	INSTRUCTION MANUAL(VHR-7530G)
OR		613 111 6382	INSTRUCTION MANUAL(VHR-7500EX)
OR		613 111 6399	INSTRUCTION MANUAL(VHR-8500SP)
		613 096 6773	CABLE,ANT
		613 082 5384	INSTRUCTION MANUAL,VPT (VHR-7540G ONLY)
		613 064 7047	GUARANTEE CARD(VHR-8500SP ONLY)

CABINET & CHASSIS PARTS

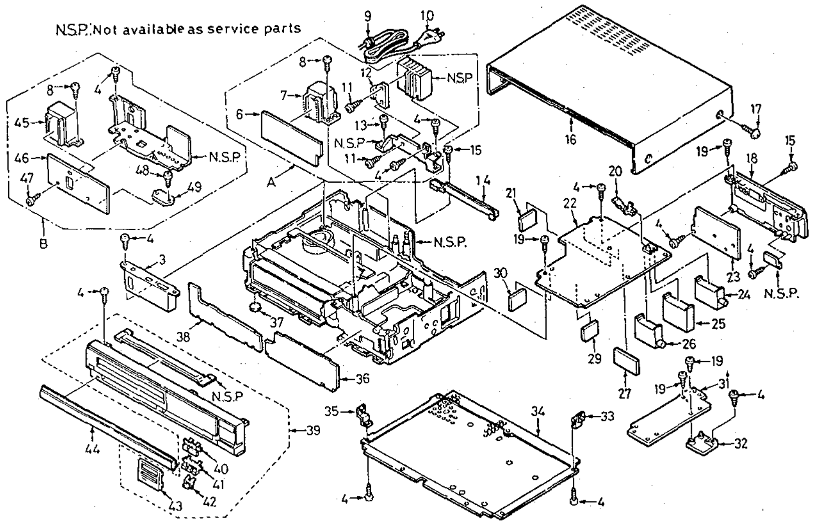
LOCATION		PARTS NO.	DESCRIPTION
3		613 110 9681	COMPL,VP-1
4		411 137 0007	SCR L-TPG BIN 3X10
6		613 109 4505	COMPL,PW-1(VHR-7500G,7530G)
OR		613 109 4512	COMPL,PW-1(VHR-7500EX,8500SP)
7	⚠	613 110 4211	TRANS,POWER,T5001(EXCEPT VHR-7540G)
8		411 021 9604	SCR S-TPG BIN 4X8
9	⚠	613 053 6686	FIXER
10	⚠	613 086 0507	CORD,POWER
OR	⚠	613 086 2150	CORD,POWER
11		411 021 4500	SCR S-TPG BIN 3X16
12		613 109 4529	COMPL,PW-2(EXCEPT VHR-7540G)
13		411 021 5705	SCR S-TPG BIN 3X6
14		613 077 3487	BLIND
15		411 021 3701	SCR S-TPG BIN 3X10
16		613 109 3782	COVER,TOP
17		412 024 7604	SPECIAL SCREW
18		613 097 3351	TERMINAL(INCLUDE CP-A)
19		411 021 3800	SCR S-TPG BIN 3X10
20		613 059 4198	SPRING PLATE
21		613 108 4186	COMPL,VD-1(EXCEPT VHR-8500SP)
22		613 115 1826	COMPL,CP-A(VHR-7500G)
OR		613 115 3707	COMPL,CP-A(VHR-7540G)
OR		613 114 4576	COMPL,CP-A(VHR-7530G)
OR		613 112 5605	COMPL,CP-A(VHR-7500EX)
OR		613 112 5612	COMPL,CP-A(VHR-8500SP)
23		613 111 3176	COMPL,TB-1(VHR-7500G,7530G)
OR		613 111 3183	COMPL,TB-1(VHR-7540G)
OR		613 111 3169	COMPL,TB-1(VHR-7500EX,8500SP)
24		613 080 5836	MODULATOR,RF
OR		613 093 2990	MODULATOR,RF
25		613 107 0547	IF PACK(EXCEPT VHR-7530G)
OR		613 108 3585	IF PACK(VHR-7530G)
26		613 107 0530	TUNER PACK(VHR-7500G,7540G,8500SP)

PACKING MATERIALS

LOCATION	PARTS NO.	DESCRIPTION
	613 115 1635	CORR CASE,INNER(VHR-7500G)
OR	613 115 3677	CORR CASE,INNER(VHR-7540G)
OR	613 114 0035	CORR CASE,INNER(VHR-7530G)
OR	613 111 6283	CORR CASE,INNER(VHR-7500EX)
OR	613 111 6290	CORR CASE,INNER(VHR-8500SP)
	613 093 7803	CUSHION,INNER,FRONT
	613 093 7810	CUSHION,INNER,BACK
	613 095 1229	POLYE COVER,INNER
	613 107 8970	BAR CODE LABEL

LOCATION	PARTS NO.	DESCRIPTION
26	613 107 9410	TUNER PACK(VHR-7530G)
OR	613 113 7974	TUNER PACK(VHR-7500EX)
27	613 109 4420	COMPL,TN-7(EXCEPT VHR-7500EX)
OR	613 109 1030	COMPL,TN-7(VHR-7500EX)
29	613 108 5534	COMPL,TM-8(VHR-7500G,7530G,7540G)
30	613 109 4550	COMPL,SY-7
31	613 111 3589	COMPL,VPT UNIT(VHR-7540G ONLY)
32	613 096 4465	BRACKET,VPT(VHR-7540G ONLY)
33	613 048 6912	BRACKET
34	613 022 0578	COVER,BOTTOM
35	613 022 0738	BRACKET,CABINET
36	613 112 5056	COMPL,TM-1(VHR-7500G,8500SP)
OR	613 112 5063	COMPL,TM-1(VHR-7540G)
OR	613 114 3456	COMPL,TM-1(VHR-7530G)
OR	613 112 5070	COMPL,TM-1(VHR-7500EX)
37	613 047 1772	STAND
38	613 108 9761	COMPL,TM-2
39	613 110 6796	ASSY,CABINET,FRONT
40	613 109 1979	HINGE BUTTON,STOP PLAY
41	613 109 1986	HINGE BUTTON,PAUSE REW FF
42	613 109 1993	HINGE BUTTON,REC
43	613 109 1948	ESCUTCHEON
44	613 111 6825	ASSY,DOOR(VHR-7500G)
OR	613 111 6832	ASSY,DOOR(VHR-7540G)
OR	613 114 0905	ASSY,DOOR(VHR-7530G)
OR	613 111 6849	ASSY,DOOR(VHR-7500EX)
OR	613 111 6856	ASSY,DOOR(VHR-8500SP)
45	613 110 5928	TRANS,POWER,T5001(VHR-7540G ONLY)
46	613 110 7922	COMPL,PW-1(VHR-7540G ONLY)
47	411 021 6405	SCR S-TPG BIN 3X8
48	411 021 4302	SCR S-TPG BIN 3X14
49	409 214 8909	IC511,STK7576,INCLUDE PW-1 (VHR-7540G ONLY)

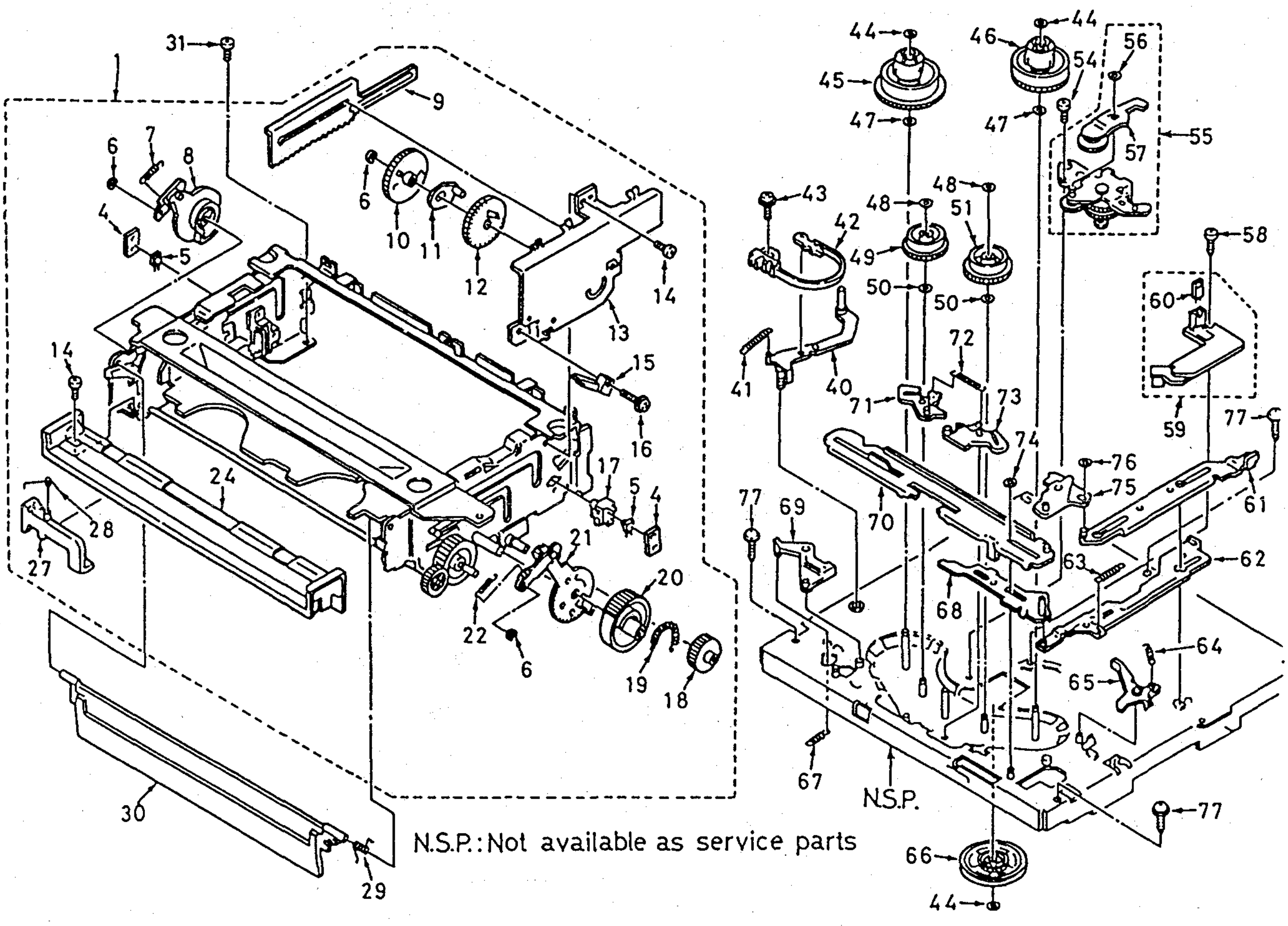
N.S.P.:Not available as service parts



A:EXCEPT VHR-7540G
B:VHR-7540G

LOCATION	PARTS NO.	DESCRIPTION
MECHANISM PARTS 1		
1	613 087 4412	COMPL,CASSETTE MECHA
4	613 022 0585	LID
5	407 098 3201	PHOTO COUPLE PN150SAN
6	411 015 9801	RING E 2.3
7	613 022 1643	SPRING,LINK L
8	613 022 0073	ASSY,GEAR,LEVER L
9	613 022 2695	RACK
10	613 022 2633	GEAR,LOCK
11	613 021 9916	ASSY,LEVER,PINION
12	613 022 2626	GEAR,PINION
13	613 021 9657	ASSY,BRACKET,GEAR
14	411 027 1305	SCR S-TPG BIN 2.6×4
15	613 006 4479	SPECIAL SWITCH
OR	613 095 0949	SPECIAL SWITCH
16	411 106 9208	SCR PAN+SW+W 2×9
17	613 022 0936	HOLDER,TRANSISTOR
18	613 022 2619	GEAR,IDLER
19	613 022 1667	SPRING,GEAR MAIN
20	613 022 2596	GEAR,MAIN
21	613 022 0097	ASSY,GEAR,LEVER R
22	613 022 1674	SPRING,LINK R
24	613 022 4064	BOARD,UNDER
27	613 022 2237	LEVER,SAFETY SWITCH
28	613 022 1827	SPRING,SAFETY SWITCH
29	613 022 1803	SPRING,DOOR
30	613 111 5330	CASSETTE DOOR
31	411 001 8702	SCR BIN 3×6
40	613 100 0391	ASSY,LEVER,TENSION
41	613 085 7996	SPRING,LEVER TENSION
42	613 021 9701	ASSY,HOLDER,BAND
43	411 036 2805	SCR PAN+SW+W 2.6×6
44	411 109 1605	WASHER Y 2.6×6×0.25
45	613 078 8375	ASSY,REEL,SUPPLY

LOCATION	PARTS NO.	DESCRIPTION
46	613 022 0110	ASSY,REEL,TAKE UP
47	412 021 5306	SPECIAL WASHER 3.1×6×0.3
OR	412 015 8900	SPECIAL WASHER 3.1×6×0.4
OR	412 015 8504	SPECIAL WASHER 3.1×6×0.5
48	411 109 1506	WASHER Y 2.1×6×0.25
OR	411 109 1407	WASHER Y 2.1×5×0.25
49	613 098 7174	GEAR,REEL SUPPLY
50	412 026 7305	SPECIAL WASHER 2.6×6×0.25
51	613 098 7181	GEAR,REEL TAKE UP
54	411 031 0905	SCR BIN 2.6×4
55	613 085 7101	COMPL,IDLER,CLUTCH
56	411 120 1301	WASHER Y 2.1×4×0.25
57	613 022 0134	ASSY,IDLER
58	411 021 3107	SCR S-TPG BIN 2.6×8
59	613 078 6302	COMPL,MC-4
60	407 016 7205	LED LN59
61	613 021 9985	ASSY,SLIDE,ACT PLATE
62	613 112 8088	SLIDE,CONTROL BRAKE
OR	613 021 9992	ASSY,SLIDE,C BRAKE
63	613 022 1612	SPRING,RETURN SLIDE
64	613 022 1506	SPRING,SUB T
65	613 098 0106	ASSY,BRAKE,SUB T
66	613 077 3647	PULLEY,REEL
67	613 022 1490	SPRING,SUB SUPPLY
68	613 022 2374	SLIDE,ACT BRAKE
69	613 084 8871	BRAKE,SUB SUPPLY
70	613 022 0004	ASSY,SLIDE,M PLATE
71	613 080 9216	ASSY,BRAKE,SUPPLY
72	613 086 2914	SPRING,MAIN BRAKE
73	613 080 9209	ASSY,BRAKE,TAKE UP
74	411 109 3005	WASHER Y 2.6×5×0.5
75	613 022 2015	LEVER,CONT PLATE
76	412 015 9501	SPECIAL WASHER
77	411 021 7907	SCR S-TPG BIN 4×12

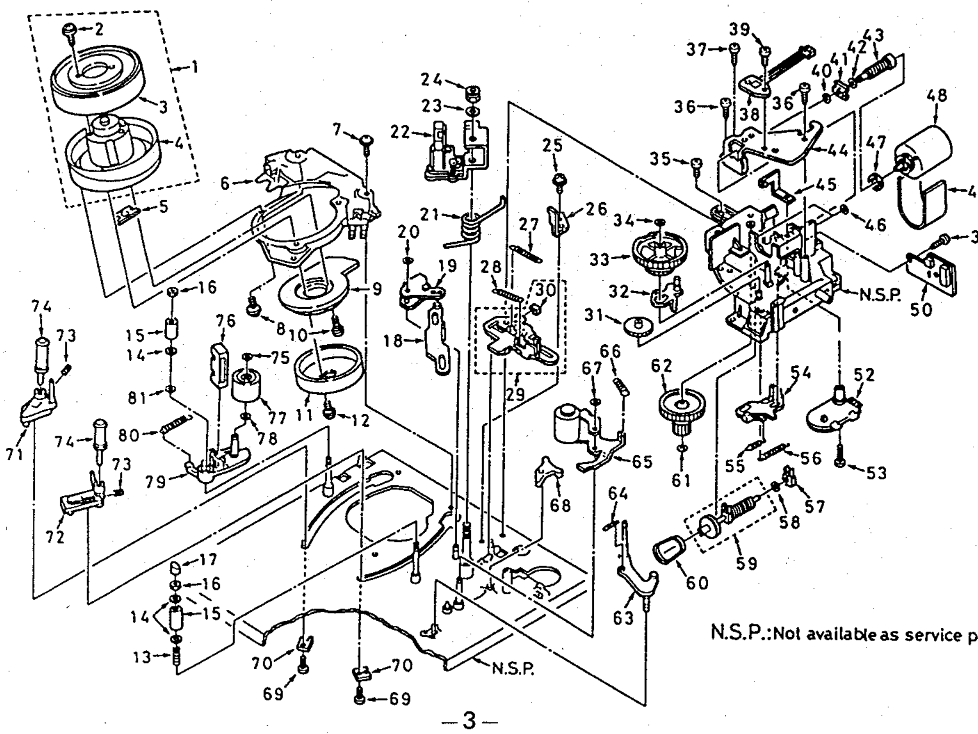


N.S.P.:Not available as service parts

MECHANISM PARTS 2

LOCATION	PARTS NO.	DESCRIPTION
1	613 096 2812	COMPL,CYLINDER,2N4P-R
OR	613 096 5059	COMPL,CYLINDER,2N4P-R
2	411 038 1608	SCR PAN+W 3×8
3	613 096 2829	ASSY,CYLINDER,UPR 2N4P-R
OR	613 096 5073	ASSY,CYLINDER,UPR 2N4P-R
4	613 022 0325	ASSY,CYLINDER,LWR 4
OR	613 078 8566	ASSY,CYLINDER,LWR 4
5	613 081 4036	SPACER,MOTOR
6	613 022 1001	BASE,CYLINDER
OR	613 088 9072	BASE,CYLINDER
7	411 047 7509	SCR PAN+FLG 3×6
8	411 047 5000	SCR PAN+FLG 2.6×8
OR	412 030 9708	SPECIAL SCREW 2.6×8
9	613 085 7279	STATOR,MOTOR CYLINDER
10	411 044 9209	SCR PAN+SW 2.3×8
OR	411 044 8301	SCR PAN+SW 2.3×10
11	613 022 4019	ROTOR,MOTOR CYLINDER
12	411 044 9001	SCR PAN+SW 2.3×6
13	613 022 1766	SPRING,ADJUST GUIDE
14	613 053 3227	SPECIAL WASHER
15	613 058 3307	TAPE GUIDE
16	412 026 2607	SPECIAL NUT (M3)
17	613 085 2434	CAP
18	613 021 9961	ASSY,SLIDE,ACT PINCH
19	613 021 9800	ASSY,LEVER,CAM PINCH
20	411 109 2008	WASHER Y 3.1×8×0.5
21	613 022 1797	SPRING,ACE HEAD
22	613 021 9640	COMPL,BRACKET,HEAD
23	613 051 4615	SPACER
OR	613 110 1692	SPACER
24	412 015 8207	SPECIAL NUT (M5)
25	411 120 0007	SCR PAN+SW+W 2.6×5
26	613 022 0752	BRACKET,STOPPER
27	613 022 1575	SPRING,LINK LOCK
28	613 022 1582	SPRING,SLIDE BRAKE
29	613 094 9233	ASSY,SLIDE,CAM
30	613 022 2725	DAMPER
31	613 022 2534	GEAR,FRONT LOAD
32	613 094 1206	ASSY,LEVER,FRONT
33	613 077 3586	GEAR,HELICAL FRONT
34	613 027 0504	WASHER 4.1×6.5×R5T
35	411 046 8002	SCR PAN+SW+W 2.6×6
36	411 023 2801	SCR S-TPG PAN 2.6×6

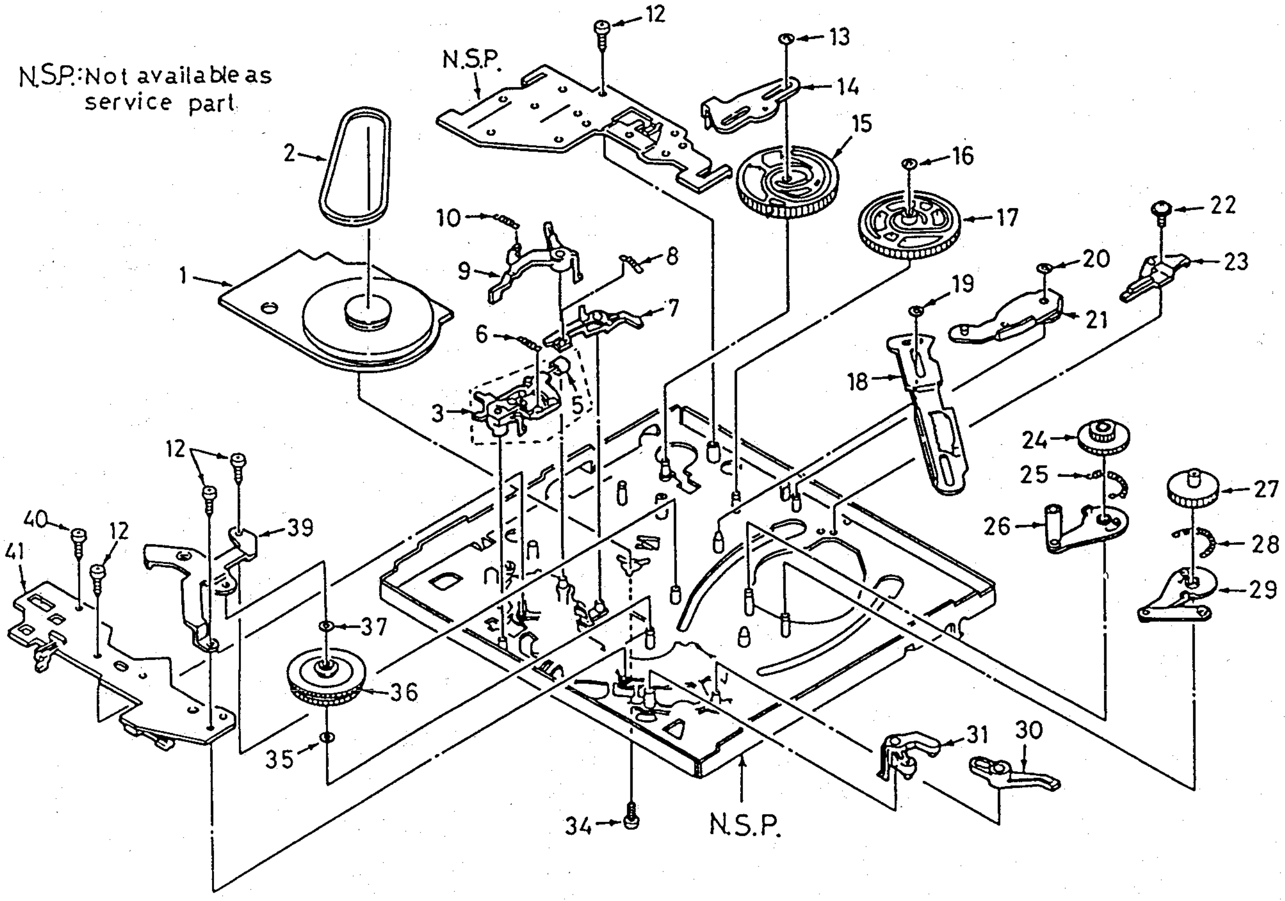
LOCATION	PARTS NO.	DESCRIPTION
37	411 021 3107	SCR S-TPG BIN 2.6×8
38	613 089 4328	ASSY,SENSOR,DEW
39	411 040 2303	SCR PAN 2.6×5
40	613 053 2381	SPECIAL WASHER
41	613 077 3227	HOLDER,WORM
42	613 027 0382	WASHER
43	613 078 8320	ASSY,WORM,FRONT
44	613 117 0599	BRACKET,HOLDER
OR	613 111 8522	BRACKET,HOLDER
OR	613 110 1203	BRACKET,HOLDER
OR	613 092 5862	BRACKET,HOLDER
45	613 093 9159	PLATE,NUT
46	613 093 8374	DAMPER,MOTOR
47	613 077 3616	DAMPER,WORM
48	613 021 9527	ASSY,LOADING MOTOR
49	613 092 9945	DAMPER,MOTOR
50	613 107 2732	COMPL,MC-3
52	613 110 0374	ROTARY SWITCH
53	411 126 5303	SCR PAN 2.6×13
54	613 092 9921	ASSY,SLIDE,FRONT
55	613 092 5985	SPRING,LEVER LOAD
56	613 092 5992	SPRING,LEVER ACT
57	613 092 5886	HOLDER,WORM
58	613 027 0627	WASHER 2.1×6×0.5
59	613 092 9938	ASSY,WORM,LOAD
60	613 022 2985	BELT,LOADING
61	412 033 4106	WASHER SLIT 2.6×5×0.5
62	613 077 3579	GEAR,HELICAL
63	613 102 9293	ASSY,LEVER,REV GUIDE
64	613 022 1568	SPRING,REVIEW LEVER
65	613 022 0158	COMPL,PINCH ROLLER
66	613 022 1483	SPRING,PINCH ROLLER
67	411 109 2107	WASHER Y 3.6×6×0.5
68	613 078 8160	COMPL,LEVER,ACT BRAKE
69	411 031 1209	SCR BIN 2.6×5
70	613 022 1919	PLATE,GUIDE
71	613 021 9725	ASSY,BASE,ROLLER S
72	613 021 9732	ASSY,BASE,ROLLER T
73	411 063 0904	SCR SET HEX-SCT 2×3
74	613 022 0233	ASSY,GUIDE,ROLLER
75	411 109 2602	WASHER Y 1.5×4×0.25
76	613 022 4224	HEAD,FULL ERASE
77	613 022 2817	IMPEDACE ROLLER
78	412 032 5807	SPECIAL WASHER 2.1×5×0.13
79	613 093 8305	ASSY,LEVER,FE HEAD
80	613 022 1698	SPRING,ERASE HEAD
81	411 109 1704	WASHER Y 6.4×10×0.25



N.S.P.:Not available as service parts

MECHANISM PARTS 3

LOCATION	PARTS NO.	DESCRIPTION
1	613 022 4491	MOTOR,CAPSTAN
OR	613 080 8929	MOTOR,CAPSTAN
2	613 022 2978	BELT,REEL DRIVE
3	613 021 9848	ASSY,LEVER,CLUTCH
5	613 079 1023	DAMPER,LEVER CLUTCH
6	613 022 1520	SPRING,LEVER CLUTCH
7	613 082 3434	LEVER,CHANGE CLUTCH
8	613 022 1711	SPRING,CHANGE CLUTCH
9	613 081 7518	ASSY,BRAKE CAPSTAN
10	613 098 2285	SPRING,CAPSTAN
12	411 021 3107	SCR S-TPG BIN 2.6×8
13	411 109 2008	WASHER Y 3.1×8×0.5
14	613 021 9978	ASSY,SLIDE,CAM PLATE
15	613 022 2701	CAM,MODE
16	411 109 1902	WASHER Y 3.1×6×0.5
17	613 022 2718	CAM,MAIN
18	613 022 2664	RACK,LOAD
19	411 109 1803	WASHER Y 2.6×6×0.5
20	411 109 2107	WASHER Y 3.6×6×0.5
OR	411 109 2206	WASHER Y 3.6×8×0.5
21	613 021 9794	ASSY,LEVER,CAM LOAD
22	411 047 6809	SCR PAN+FLG 3×4
23	613 021 9763	ASSY,EARTH,CYLINDER
24	613 090 6380	GEAR,LOAD TAKE UP
25	613 022 1551	SPRING,GEAR LOAD T
26	613 021 9879	ASSY,LEVER,LOAD T
27	613 090 6373	GEAR,LOAD SUPPLY
28	613 022 1704	SPRING,GEAR LOAD S
29	613 021 9862	ASSY,LEVER,LOAD S
30	613 022 2039	LEVER,RETURN TENSION
31	613 091 3104	ASSY,LEVER CONTROL
34	411 040 2303	SCR PAN 2.6×5
35	412 015 8603	SPECIAL WASHER 3.1×6×0.25
36	613 102 0900	ASSY,GEAR,FRICTION
37	411 109 1605	WASHER Y 2.6×6×0.25
39	613 079 8121	BRACKET,PULLEY
40	411 100 0300	SCR S-TPG BIN 2.6×5
41	613 110 1357	COMPL,MC-1
R1	401 026 0607	CARBON 270 JA 1/6W
OR	401 017 0708	CARBON 270 JA 1/4W
R2	401 024 6700	CARBON 100 JA 1/6W
OR	401 012 4404	CARBON 100 JA 1/4W
R3	401 026 0607	CARBON 270 JA 1/6W
OR	401 017 0708	CARBON 270 JA 1/4W
D1	407 094 1300	PHOTO COUPLE SPI-315-04-C
OR	407 043 0101	PHOTO DIODE ON2170-R
D2	407 094 1300	PHOTO COUPLE SPI-315-04-C
OR	407 043 0101	PHOTO DIODE ON2170-R
SW1	613 022 4545	SPECIAL SWITCH,EP



ELECTRICAL PARTS

NOTE;

*Materials of Capacitors and Resistors are abbreviated as follows;

Resistors

MT-FILE	Metal Film Resistor
MT-GLAZE	Metal Glaze Resistor
OXIDE-MT	Oxide Metal Film Resistor

Capacitors

MT-POLYEST	Metallized Polyester Capacitor
MT-COMPO	Metallized Composite Capacitor
TA-SOLID	Tantalum Solid Capacitor
AL-SOLID	Aluminum Solid Capacitor
NP-ELECT	Non-Polarized Electrolytic Capacitor
OS-SOLID	Aluminum Solid Capacitors with Organic Semiconductive Electrolytic Capacitor
DL-ELECT	Double Layered Electrolytic Capacitor

*Tolerance of Capacitor(10pF over) and Resistor are noted with follow symboles.

F ············ ±1% G ············ ±2% J ············ ±5% K ············ ±10%
M ············ ±20% N ············ ±30% Z ············ +80% ~ −20%

*N.S.P. : Not available as service parts.

LOCATION	PARTS NO.	DESCRIPTION
COMPL,CP-A		
COMPL.NO.	613 115 1826	(VHR-7500G)
COMPL.NO.	613 115 3707	(VHR-7540G)
COMPL.NO.	613 114 4576	(VHR-7530G)
COMPL.NO.	613 112 5605	(VHR-7500EX)
COMPL.NO.	613 112 5612	(VHR-8500SP)
VIDEO CIRCUIT(VD-A)		
B1001	405 000 6104	TR DTC144ES-DCTP
OR	405 018 2501	TR 2SC3399-AC
B1201	405 000 6104	TR DTC144ES-DCTP(EXCEPT VHR-8500SP)
OR	405 018 2501	TR 2SC3399-AC(EXCEPT VHR-8500SP)
C1001	403 025 7007	CERAMIC 4.7P D 50V
C1002	403 073 2702	CERAMIC 390P J 50V
C1003	403 026 2209	CERAMIC 47P J 50V
C1004	403 179 4501	NP-ELECT 0.47U M 50V
C1005	403 150 1703	CERAMIC 91P J 50V
C1006	403 071 1509	CERAMIC 180P J 50V
C1007	403 075 4001	CERAMIC 820P J 50V
C1008	403 134 4706	NP-ELECT 2.2U M 50V
C1009	403 001 1906	CERAMIC 0.01U M 16V
C1010	403 121 3408	ELECT 2.2U M 50V
C1011	403 130 2904	ELECT 0.47U M 50V
C1012	403 075 3103	CERAMIC 82P J 50V
C1013	403 068 8801	CERAMIC 100P J 50V
C1014	403 063 2200	POLYESTER 0.068U K 50V
C1015	403 001 1906	CERAMIC 0.01U M 16V
C1016	403 001 1906	CERAMIC 0.01U M 16V
C1017	403 001 1906	CERAMIC 0.01U M 16V
C1018	403 135 4002	ELECT 47U M 6.3V
C1019	403 121 3408	ELECT 2.2U M 50V
C1020	403 107 9905	ELECT 10U M 16V
C1021	403 121 3408	ELECT 2.2U M 50V
C1023	403 001 1906	CERAMIC 0.01U M 16V
C1024	403 121 2104	ELECT 22U M 10V
C1025	403 130 2904	ELECT 0.47U M 50V
C1031	403 001 1906	CERAMIC 0.01U M 16V
C1032	403 139 1403	ELECT 47U M 10V
C1033	403 139 2707	ELECT 1U M 50V
C1034	403 028 3402	CERAMIC 56P J 50V
C1035	403 025 7007	CERAMIC 4.7P D 50V
C1036	403 022 7703	CERAMIC 33P J 50V
C1037	403 139 2202	ELECT 4.7U M 25V
C1038	403 001 1906	CERAMIC 0.01U M 16V
C1039	403 001 1906	CERAMIC 0.01U M 16V
C1040	403 073 6205	CERAMIC 470P J 50V
C1051	403 001 1906	CERAMIC 0.01U M 16V
C1058	403 030 6309	CERAMIC 68P J 50V
C1059	403 026 2209	CERAMIC 47P J 50V
C1060	403 135 4002	ELECT 47U M 6.3V
C1061	403 001 1906	CERAMIC 0.01U M 16V
C1063	403 022 7703	CERAMIC 33P J 50V
C1065	403 024 1501	CERAMIC 39P J 50V
C1101	403 003 2505	CERAMIC 0.022U J 25V
C1102	403 001 1906	CERAMIC 0.01U M 16V
C1103	403 109 6308	ELECT 1U M 50V
C1104	403 001 1906	CERAMIC 0.01U M 16V
C1105	403 109 6308	ELECT 1U M 50V
C1106	403 109 6308	ELECT 1U M 50V
C1107	403 003 2505	CERAMIC 0.022U J 25V
C1108	403 104 8505	CERAMIC 0.047U J 25V
C1109	403 001 1906	CERAMIC 0.01U M 16V
C1110	403 139 1809	ELECT 47U M 16V
C1111	403 001 1906	CERAMIC 0.01U M 16V
C1112	403 109 6308	ELECT 1U M 50V
C1113	403 104 8505	CERAMIC 0.047U J 25V
C1114	403 025 8608	CERAMIC 43P J 50V
C1115	403 150 1703	CERAMIC 91P J 50V
C1116	403 001 1906	CERAMIC 0.01U M 16V
C1117	403 135 4002	ELECT 47U M 6.3V
C1118	403 068 8801	CERAMIC 100P J 50V
C1119	403 001 1906	CERAMIC 0.01U M 16V
C1120	403 001 1906	CERAMIC 0.01U M 16V
C1121	403 001 1906	CERAMIC 0.01U M 16V
C1124	403 073 8407	CERAMIC 4700P K 50V
C1125	403 070 3702	CERAMIC 120P J 50V
C1126	403 001 1906	CERAMIC 0.01U M 16V
C1128	403 071 6207	CERAMIC 220P K 50V
C1201	403 074 8703	CERAMIC 680P J 50V (EXCEPT VHR-8500SP)
C1281	403 030 6309	CERAMIC 68P J 50V (EXCEPT VHR-8500SP)
OR	403 075 4001	CERAMIC 820P J 50V (VHR-8500SP)
C1301	403 003 3700	CERAMIC 0.022U Z 25V
C1351	403 022 7703	CERAMIC 33P J 50V
C1352	403 014 2600	CERAMIC 18P J 50V
C1401	403 139 2202	ELECT 4.7U M 25V
C1605	403 135 4101	ELECT 470U M 6.3V
C1608	403 162 1807	ELECT 22U M 10V
C1609	403 094 2408	OS-SOLID 4.7U M 16V
C1631	403 022 7703	CERAMIC 33P J 50V
C1632	403 024 1501	CERAMIC 39P J 50V
C1682	403 012 6006	CERAMIC 15P J 50V (EXCEPT VHR-8500SP)
C1691	403 074 8703	CERAMIC 680P J 50V
C1698	403 001 1906	CERAMIC 0.01U M 16V
C1699	403 001 1906	CERAMIC 0.01U M 16V

LOCATION	PARTS NO.	DESCRIPTION
D1001	407 007 9904	DIODE GMA01-BT
OR	407 012 4406	DIODE 1SS133-T-77
D1002	407 007 9904	DIODE GMA01-BT
OR	407 012 4406	DIODE 1SS133-T-77
D1031	407 070 8408	ZENER DIODE GZS9.1Y-TB
OR	407 053 8906	ZENER DIODE MTZ9.1C-T-77
D1301	407 012 4406	DIODE 1SS133-T-77
OR	407 007 9904	DIODE GMA01-BT
D1302	407 012 4406	DIODE 1SS133-T-77
OR	407 007 9904	DIODE GMA01-BT
D1303	407 012 4406	DIODE 1SS133-T-77
OR	407 007 9904	DIODE GMA01-BT
D1304	407 012 4406	DIODE 1SS133-T-77
OR	407 007 9904	DIODE GMA01-BT
D1399	407 012 4406	DIODE 1SS133-T-77
OR	407 007 9904	DIODE GMA01-BT
D1604	407 007 9904	DIODE GMA01-BT
OR	407 012 4406	DIODE 1SS133-T-77
D1651	407 007 9904	DIODE GMA01-BT
OR	407 012 4406	DIODE 1SS133-T-77
DL131	613 116 7001	DELAY,2H
OR	613 117 4870	DELAY,2H
IC101	409 178 3309	IC LA7340
IC102	409 171 9209	IC LC8992
IC111	409 208 7208	IC LA7332
L1001	613 014 0951	COIL,INDUCTOR 68UHK
L1031	613 014 0944	COIL,INDUCTOR 56UHK
L1032	613 014 0913	COIL,INDUCTOR 33UHK
L1033	613 014 0739	COIL,INDUCTOR 1.0UHM
L1054	613 014 0876	COIL,INDUCTOR 15UHK
L1055	613 014 0876	COIL,INDUCTOR 15UHK
L1057	613 014 0821	COIL,INDUCTOR 5.6UHK
L1058	613 014 0937	COIL,INDUCTOR 47UHK
L1101	613 014 0883	COIL,INDUCTOR 18UHK
L1102	613 014 0791	COIL,INDUCTOR 3.3UHK
L1103	613 014 0876	COIL,INDUCTOR 15UHK
L1104	613 015 6327	COIL,INDUCTOR 1MHJ
L1105	613 014 0920	COIL,INDUCTOR 39UHK
L1631	613 014 0975	COIL,INDUCTOR 100UHK
L1681	613 014 0777	COIL,INDUCTOR 2.2UHM (EXCEPT VHR-8500SP)
L1691	613 014 0975	COIL,INDUCTOR 100UHK
Q1001	405 093 0508	TR KSA1175-Y
OR	405 004 4007	TR 2SA608-E-SPA-AC
OR	405 004 4601	TR 2SA608-F-SPA-AC
OR	405 006 1707	TR 2SA933S-TP-Q
OR	405 006 1806	TR 2SA933S-T93-R
Q1002	405 093 0607	TR KSC2785-Y
OR	405 011 8401	TR 2SC1740S-DCTP-Q
OR	405 011 8500	TR 2SC1740S-DCTP-R
OR	405 019 2005	TR 2SC536-E-SPA-AC
OR	405 019 2807	TR 2SC536-F-SPA-AC
Q1003	405 093 0607	TR KSC2785-Y
OR	405 011 8401	TR 2SC1740S-DCTP-Q
OR	405 011 8500	TR 2SC1740S-DCTP-R
OR	405 019 2005	TR 2SC536-E-SPA-AC
OR	405 019 2807	TR 2SC536-F-SPA-AC
Q1031	405 093 0508	TR KSA1175-Y
OR	405 004 4007	TR 2SA608-E-SPA-AC
OR	405 004 4601	TR 2SA608-F-SPA-AC
OR	405 006 1707	TR 2SA933S-TP-Q
OR	405 006 1806	TR 2SA933S-T93-R
Q1032	405 019 2005	TR 2SC536-E-SPA-AC
OR	405 019 2807	TR 2SC536-F-SPA-AC
OR	405 011 8401	TR 2SC1740S-DCTP-Q

LOCATION	PARTS NO.	DESCRIPTION
Q1032	405 011 8500	TR 2SC1740S-DCTP-R
OR	405 093 0607	TR KSC2785-Y
Q1052	405 012 9506	TR 2SC2058S-DCTP-Q
OR	405 015 2504	TR 2SC2669-O-TPE4
OR	405 015 2603	TR 2SC2669-Y-TPE4
OR	405 016 0905	TR 2SC2839-E-SPA-AC
OR	405 016 1100	TR 2SC2839-F-SPA-AC
Q1054	405 012 9506	TR 2SC2058S-DCTP-Q
OR	405 015 2504	TR 2SC2669-O-TPE4
OR	405 015 2603	TR 2SC2669-Y-TPE4
OR	405 016 0905	TR 2SC2839-E-SPA-AC
OR	405 016 1100	TR 2SC2839-F-SPA-AC
Q1055	405 012 9506	TR 2SC2058S-DCTP-Q
OR	405 015 2504	TR 2SC2669-O-TPE4
OR	405 015 2603	TR 2SC2669-Y-TPE4
OR	405 016 0905	TR 2SC2839-E-SPA-AC
OR	405 016 1100	TR 2SC2839-F-SPA-AC
Q1101	405 093 0508	TR KSA1175-Y
OR	405 004 4007	TR 2SA608-E-SPA-AC
OR	405 004 4601	TR 2SA608-F-SPA-AC
OR	405 006 1707	TR 2SA933S-TP-Q
OR	405 006 1806	TR 2SA933S-T93-R
Q1102	405 093 0607	TR KSC2785-Y
OR	405 011 8401	TR 2SC1740S-DCTP-Q
OR	405 011 8500	TR 2SC1740S-DCTP-R
OR	405 019 2005	TR 2SC536-E-SPA-AC
OR	405 019 2807	TR 2SC536-F-SPA-AC
Q1103	405 093 0607	TR KSC2785-Y
OR	405 011 8401	TR 2SC1740S-DCTP-Q
OR	405 011 8500	TR 2SC1740S-DCTP-R
OR	405 019 2005	TR 2SC536-E-SPA-AC
OR	405 019 2807	TR 2SC536-F-SPA-AC
Q1104	405 093 0607	TR KSC2785-Y
OR	405 011 8401	TR 2SC1740S-DCTP-Q
OR	405 011 8500	TR 2SC1740S-DCTP-R
OR	405 019 2005	TR 2SC536-E-SPA-AC
OR	405 019 2807	TR 2SC536-F-SPA-AC
Q1105	405 093 0607	TR KSC2785-Y
OR	405 011 8401	TR 2SC1740S-DCTP-Q
OR	405 011 8500	TR 2SC1740S-DCTP-R
OR	405 019 2005	TR 2SC536-E-SPA-AC
OR	405 019 2807	TR 2SC536-F-SPA-AC
Q1106	405 093 0607	TR KSC2785-Y
OR	405 011 8401	TR 2SC1740S-DCTP-Q
OR	405 011 8500	TR 2SC1740S-DCTP-R
OR	405 019 2005	TR 2SC536-E-SPA-AC
OR	405 019 2807	TR 2SC536-F-SPA-AC
Q1151	405 004 4007	TR 2SA608-E-SPA-AC
OR	405 004 4601	TR 2SA608-F-SPA-AC
OR	405 006 1707	TR 2SA933S-TP-Q
OR	405 006 1806	TR 2SA933S-T93-R
OR	405 093 0508	TR KSA1175-Y
Q1301	405 004 4007	TR 2SA608-E-SPA-AC
OR	405 004 4601	TR 2SA608-F-SPA-AC
OR	405 006 1707	TR 2SA933S-TP-Q
OR	405 006 1806	TR 2SA933S-T93-R
OR	405 093 0508	TR KSA1175-Y
Q1302	405 019 2005	TR 2SC536-E-SPA-AC
OR	405 019 2807	TR 2SC536-F-SPA-AC
OR	405 011 8401	TR 2SC1740S-DCTP-Q
OR	405 011 8500	TR 2SC1740S-DCTP-R
OR	405 093 0607	TR KSC2785-Y
Q1401	405 093 0607	TR KSC2785-Y
OR	405 011 8401	TR 2SC1740S-DCTP-Q
OR	405 011 8500	TR 2SC1740S-DCTP-R
OR	405 019 2005	TR 2SC536-E-SPA-AC
OR	405 019 2807	TR 2SC536-F-SPA-AC
Q1402	405 006 6504	TR 2SA984-E-AA
OR	405 006 6702	TR 2SA984-F-AA

LOCATION	PARTS NO.	DESCRIPTION
Q1403	405 093 0607	TR KSC2785-Y
OR	405 011 8401	TR 2SC1740S-DCTP-Q
OR	405 011 8500	TR 2SC1740S-DCTP-R
OR	405 019 2005	TR 2SC536-E-SPA-AC
OR	405 019 2807	TR 2SC536-F-SPA-AC
Q1404	405 089 0109	TR 2SA1707-T-AN
OR	405 084 7905	TR 2SB1240-TV2-R
Q1601	405 004 4601	TR 2SA608-F-SPA-AC
OR	405 006 1806	TR 2SA933S-T93-R
Q1602	405 093 0508	TR KSA1175-Y
OR	405 004 4007	TR 2SA608-E-SPA-AC
OR	405 004 4601	TR 2SA608-F-SPA-AC
OR	405 006 1707	TR 2SA933S-TP-Q
OR	405 006 1806	TR 2SA933S-T93-R
Q1631	405 093 0607	TR KSC2785-Y
OR	405 011 8401	TR 2SC1740S-DCTP-Q
OR	405 011 8500	TR 2SC1740S-DCTP-R
OR	405 019 2005	TR 2SC536-E-SPA-AC
OR	405 019 2807	TR 2SC536-F-SPA-AC
R1001	401 012 5609	CARBON 1K JA 1/4W
R1002	401 017 1705	CARBON 2.7K JA 1/4W
R1003	401 022 1806	CARBON 680 JA 1/4W
R1004	401 012 9201	CARBON 1M JA 1/4W
R1005	401 012 5609	CARBON 1K JA 1/4W
R1006	401 017 1705	CARBON 2.7K JA 1/4W
R1007	401 012 5609	CARBON 1K JA 1/4W
R1008	401 022 1806	CARBON 680 JA 1/4W
R1009	401 012 5609	CARBON 1K JA 1/4W
R1010	401 017 8506	CARBON 300 JA 1/4W
R1011	401 015 2605	CARBON 1.8K JA 1/4W
R1012	401 015 4609	CARBON 180K JA 1/4W
R1013	401 012 9201	CARBON 1M JA 1/4W
R1014	401 016 3700	CARBON 2.2K JA 1/4W
R1015	401 023 2703	CARBON 8.2K JA 1/4W
R1016	401 013 5202	CARBON 1.2K JA 1/4W
R1017	401 018 4804	CARBON 33K JA 1/4W
R1018	401 012 5609	CARBON 1K JA 1/4W
R1019	401 016 2505	CARBON 220 JA 1/4W
R1020	401 020 3802	CARBON 470K JA 1/4W
R1021	401 014 6000	CARBON 150K JA 1/4W
R1022	401 022 1806	CARBON 680 JA 1/4W
R1023	401 016 4707	CARBON 22K JA 1/4W
R1024	401 020 2805	CARBON 47K JA 1/4W
R1025	401 016 3700	CARBON 2.2K JA 1/4W
R1031	401 012 5609	CARBON 1K JA 1/4W
R1032	401 012 5609	CARBON 1K JA 1/4W
R1033	401 019 9501	CARBON 47 JA 1/4W
R1034	401 020 7404	CARBON 51 JA 1/4W
R1051	401 016 3700	CARBON 2.2K JA 1/4W
R1052	401 016 3700	CARBON 2.2K JA 1/4W
R1056	401 020 0702	CARBON 470 JA 1/4W
R1057	401 022 1806	CARBON 680 JA 1/4W
R1066	401 023 1607	CARBON 820 JA 1/4W
R1067	401 012 5609	CARBON 1K JA 1/4W
R1068	401 022 7105	CARBON 750 JA 1/4W
R1069	401 016 2505	CARBON 220 JA 1/4W
R1070	401 012 5609	CARBON 1K JA 1/4W
R1071	401 012 5609	CARBON 1K JA 1/4W
R1072	401 020 0702	CARBON 470 JA 1/4W
R1101	401 020 2805	CARBON 47K JA 1/4W
R1102	401 016 4707	CARBON 22K JA 1/4W
R1103	401 012 5609	CARBON 1K JA 1/4W
R1104	401 013 5202	CARBON 1.2K JA 1/4W
R1105	401 018 2701	CARBON 330 JA 1/4W
R1106	401 021 1807	CARBON 560 JA 1/4W
R1107	401 012 5609	CARBON 1K JA 1/4W
R1108	401 012 5609	CARBON 1K JA 1/4W
R1109	401 012 6903	CARBON 10K JA 1/4W
R1110	401 023 2703	CARBON 8.2K JA 1/4W
R1111	401 012 5609	CARBON 1K JA 1/4W
R1112	401 015 2605	CARBON 1.8K JA 1/4W
R1113	401 012 8006	CARBON 100K JA 1/4W
R1114	401 019 0904	CARBON 390 JA 1/4W
R1115	401 012 5609	CARBON 1K JA 1/4W
R1116	401 012 5609	CARBON 1K JA 1/4W
R1117	401 014 4006	CARBON 1.5K JA 1/4W
R1118	401 022 7105	CARBON 750 JA 1/4W
R1119	401 012 5609	CARBON 1K JA 1/4W
R1120	401 012 4404	CARBON 100 JA 1/4W
R1121	401 012 5609	CARBON 1K JA 1/4W
R1122	401 020 0702	CARBON 470 JA 1/4W
R1123	401 014 4006	CARBON 1.5K JA 1/4W
R1124	401 015 8805	CARBON 200 JA 1/4W
R1125	401 022 1806	CARBON 680 JA 1/4W
R1126	401 012 5609	CARBON 1K JA 1/4W
R1127	401 014 2804	CARBON 150 JA 1/4W
R1128	401 012 5609	CARBON 1K JA 1/4W
R1152	401 019 1802	CARBON 3.9K JA 1/4W
R1301	401 012 6903	CARBON 10K JA 1/4W
R1302	401 012 5609	CARBON 1K JA 1/4W
R1303	401 012 5609	CARBON 1K JA 1/4W
R1304	401 020 2805	CARBON 47K JA 1/4W
R1305	401 016 4707	CARBON 22K JA 1/4W
R1306	401 015 4609	CARBON 180K JA 1/4W
R1351	401 021 1807	CARBON 560 JA 1/4W
R1352	401 023 2703	CARBON 8.2K JA 1/4W
R1401	401 016 4707	CARBON 22K JA 1/4W
R1402	401 016 4707	CARBON 22K JA 1/4W
R1403	401 023 2703	CARBON 8.2K JA 1/4W
R1404	401 020 1907	CARBON 4.7K JA 1/4W
R1405	401 020 2805	CARBON 47K JA 1/4W
R1406	401 020 2805	CARBON 47K JA 1/4W
R1407	401 015 2605	CARBON 1.8K JA 1/4W
R1408	401 016 2505	CARBON 220 JA 1/4W
R1603	401 012 6903	CARBON 10K JA 1/4W
R1607	401 021 1807	CARBON 560 JA 1/4W
R1608	401 022 6702	CARBON 75 JA 1/4W
R1609	401 013 9408	CARBON 1.3K JA 1/4W
R1610	401 021 1807	CARBON 560 JA 1/4W
R1631	401 021 2903	CARBON 5.6K JA 1/4W
R1632	401 012 5609	CARBON 1K JA 1/4W
R1633	401 023 1607	CARBON 820 JA 1/4W
R1634	401 015 2605	CARBON 1.8K JA 1/4W
R1641	401 015 2605	CARBON 1.8K JA 1/4W
VR101	613 001 9370	SEMI VR 1KB
OR	613 001 8977	SEMI VR 1KB
VR102	613 001 9035	SEMI VR 10KB
OR	613 001 9417	SEMI VR 10KB
VR103	613 001 9424	SEMI VR 20KB
OR	613 001 9059	SEMI VR 22KB
VR104	613 001 9035	SEMI VR 10KB
OR	613 001 9417	SEMI VR 10KB
VR105	613 001 8977	SEMI VR 1KB
OR	613 001 9370	SEMI VR 1KB
X1101	613 080 9407	OSC.CRYSTAL 4.43MHZ
OR	613 093 8008	OSC.CRYSTAL 4.433619MHZ
XF101	613 004 5539	LC PACK 4MHZ LPF
XF111	613 111 3800	FILTER,5.06 4.43M B,1M L

AUDIO CIRCUIT(AD-A)

B2101	405 018 2501	TR 2SC3399-AC
OR	405 000 6104	TR DTC144ES-DCTP

LOCATION	PARTS NO.	DESCRIPTION
C2001	403 049 1401	ELECT 1U M 50V
C2002	403 075 4506	CERAMIC 820P K 50V
C2004	403 135 3708	ELECT 33U M 6.3V
C2005	403 003 0600	CERAMIC 0.018U K 25V
C2006	403 130 2904	ELECT 0.47U M 50V
C2007	403 072 4707	CERAMIC 270P K 50V (VHR-7540G ONLY)
C2008	403 001 6505	CERAMIC 3300P K 16V
C2009	403 135 4002	ELECT 47U M 6.3V
C2010	403 107 9905	ELECT 10U M 16V
C2013	403 003 2406	CERAMIC 0.022U J 25V
C2016	403 109 6308	ELECT 1U M 50V
C2017	403 134 5901	ELECT 33U M 16V
C2018	403 121 3002	ELECT 4.7U M 25V
C2019	403 134 9602	ELECT 47U M 16V
C2020	403 071 6207	CERAMIC 220P K 50V
C2021	403 081 7409	POLYPRO 0.033U J 100V
C2022	403 002 1905	CERAMIC 0.01U K 25V
C2024	403 002 1905	CERAMIC 0.01U K 25V
C2025	403 003 3700	CERAMIC 0.022U Z 25V
C2051	403 069 1207	CERAMIC 1000P K 50V
C2071	403 075 4506	CERAMIC 820P K 50V
C2072	403 109 6308	ELECT 1U M 50V
C2073	403 003 8606	CERAMIC 0.039U J 25V
D2101	407 012 4406	DIODE 1SS133-T-77
OR	407 007 9904	DIODE GMA01-BT
D2102	407 012 4406	DIODE 1SS133-T-77
OR	407 007 9904	DIODE GMA01-BT
IC201	409 133 1401	IC LA7294
L2001	613 015 5474	HF CHOKE 27MH(VHR-7540G ONLY)
L2002	613 014 3037	COIL,INDUCTOR 10MHJ
L2003	613 014 2870	COIL,INDUCTOR 560UHK
Q2001	405 024 9709	TR 2SD734-E-AA
OR	405 024 9907	TR 2SD734-F-AA
Q2101	405 033 6706	TR 2SD1468S-DCTP-R
OR	405 033 6805	TR 2SD1468S-DCTP-S
Q2102	405 033 6706	TR 2SD1468S-DCTP-R
OR	405 033 6805	TR 2SD1468S-DCTP-S
R2001	401 012 4404	CARBON 100 JA 1/4W
R2002	401 022 3008	CARBON 6.8K JA 1/4W
R2003	401 023 0600	CARBON 82 JA 1/4W
R2004	401 019 3905	CARBON 390K JA 1/4W
R2005	401 021 8905	CARBON 6.2K JA 1/4W
R2006	401 017 1705	CARBON 2.7K JA 1/4W
R2009	401 018 6501	CARBON 3.3M JA 1/4W
R2010	401 012 6903	CARBON 10K JA 1/4W
R2011	401 016 0006	CARBON 20K JA 1/4W
R2012	401 022 7600	CARBON 7.5K JA 1/4W
R2013	401 012 5609	CARBON 1K JA 1/4W
R2014	401 015 2605	CARBON 1.8K JA 1/4W
R2016	401 012 6903	CARBON 10K JA 1/4W
R2017	401 012 6903	CARBON 10K JA 1/4W
R2018	401 015 3701	CARBON 18K JA 1/4W
R2019	401 015 3701	CARBON 18K JA 1/4W
R2021	401 012 3308	CARBON 10 JA 1/4W
R2022	401 019 9501	CARBON 47 JA 1/4W
R2023	401 014 5102	CARBON 15K JA 1/4W
R2024	401 019 6104	CARBON 4.7 JA 1/4W
R2051	401 012 5609	CARBON 1K JA 1/4W
R2071	401 013 4106	CARBON 120 JA 1/4W
R2072	401 012 6903	CARBON 10K JA 1/4W
R2101	401 020 2805	CARBON 47K JA 1/4W
R2102	401 019 2908	CARBON 39K JA 1/4W
R2103	401 020 2805	CARBON 47K JA 1/4W

LOCATION	PARTS NO.	DESCRIPTION
R2104	401 015 3701	CARBON 18K JA 1/4W
R2109	401 012 5609	CARBON 1K JA 1/4W
R2110	401 023 1607	CARBON 820 JA 1/4W
R2111	401 012 6903	CARBON 10K JA 1/4W
R2112	401 012 6903	CARBON 10K JA 1/4W
R2113	401 012 6903	CARBON 10K JA 1/4W
R2114	401 016 3700	CARBON 2.2K JA 1/4W
R2115	401 016 3700	CARBON 2.2K JA 1/4W
T2001	613 016 2205	OSC COIL 70KHZ
OR	613 094 3378	TRANS,OSC 70KHZ
VR201	613 001 9097	SEMI VR 100KB
VR202	613 001 9035	SEMI VR 10KB

SYSTEM CONTROL CIRCUIT(SY-A)

B3001	405 018 2808	TR 2SC3402-AC
C3001	403 155 2804	DL-ELECT 0.047F Z 5.5V
C3002	403 135 3500	ELECT 220U M 6.3V
C3003	403 121 9509	CERAMIC 0.1U Z 50V
D3002	407 012 4406	DIODE 1SS133-T-77
OR	407 007 9904	DIODE GMA01-BT
D3003	407 012 4406	DIODE 1SS133-T-77
OR	407 007 9904	DIODE GMA01-BT
IC301	410 095 5703	IC UPD75516GF-117-3B9
R3001	402 036 4401	FUSIBLE RES 3.3 JA 1/2W
OR	402 036 3701	FUSIBLE RES 3.3 JA 1/2W
R3002	401 020 1907	CARBON 4.7K JA 1/4W
R3003	401 020 1907	CARBON 4.7K JA 1/4W
R3004	401 012 6903	CARBON 10K JA 1/4W
R3005	401 014 4006	CARBON 1.5K JA 1/4W
R3006	401 014 4006	CARBON 1.5K JA 1/4W
R3007	401 019 1802	CARBON 3.9K JA 1/4W
R3008	401 020 1907	CARBON 4.7K JA 1/4W
R3009	401 016 5704	CARBON 220K JA 1/4W
R3010	401 016 5704	CARBON 220K JA 1/4W
R3011	401 012 5609	CARBON 1K JA 1/4W
R3012	401 012 5609	CARBON 1K JA 1/4W
R3013	401 016 5704	CARBON 220K JA 1/4W
R3014	401 012 5609	CARBON 1K JA 1/4W
R3015	401 016 5704	CARBON 220K JA 1/4W
R3016	401 012 6903	CARBON 10K JA 1/4W
R3017	401 020 1907	CARBON 4.7K JA 1/4W
R3018	401 016 5704	CARBON 220K JA 1/4W
R3019	401 012 6903	CARBON 10K JA 1/4W
R3020	401 020 1907	CARBON 4.7K JA 1/4W
R3022	401 016 5704	CARBON 220K JA 1/4W
R3024	401 023 4509	CARBON 820K JA 1/4W
R3202	401 020 1907	CARBON 4.7K JA 1/4W
R3203	401 020 1907	CARBON 4.7K JA 1/4W
R3206	401 016 0006	CARBON 20K JA 1/4W
R3207	401 017 1705	CARBON 2.7K JA 1/4W
R3209	401 020 1907	CARBON 4.7K JA 1/4W
XF301	613 097 9698	RESONATOR,CERAMIC 4.0MHZ
OR	613 108 2496	RESONATOR,CERAMIC 4.0MHZ

SERVO CIRCUIT(SV-A)

B3501	405 003 7603	TR 2SA1345-AC
OR	405 000 2205	TR DTA144ES-DCTP
B3502	405 003 7603	TR 2SA1345-AC
OR	405 000 2205	TR DTA144ES-DCTP
B3503	405 018 2501	TR 2SC3399-AC

LOCATION	PARTS NO.	DESCRIPTION
B3503	405 000 6104	TR DTC144ES-DCTP
B3506	405 018 2501	TR 2SC3399-AC
OR	405 000 6104	TR DTC144ES-DCTP
B3507	405 018 2501	TR 2SC3399-AC
OR	405 000 6104	TR DTC144ES-DCTP
B3512	405 018 2501	TR 2SC3399-AC
OR	405 000 6104	TR DTC144ES-DCTP
B3514	405 018 2501	TR 2SC3399-AC
OR	405 000 6104	TR DTC144ES-DCTP
C3501	403 057 6801	POLYESTER 0.012U J 50V
C3502	403 135 4002	ELECT 47U M 6.3V
C3503	403 121 9509	CERAMIC 0.1U Z 50V
C3504	403 071 6207	CERAMIC 220P K 50V
C3505	403 061 7306	POLYESTER 4700P J 50V
C3506	403 059 6502	POLYESTER 0.022U K 50V
C3507	403 002 8508	CERAMIC 0.015U K 25V
C3508	403 001 8806	CERAMIC 6800P K 16V
C3509	403 002 8508	CERAMIC 0.015U K 25V
C3510	403 145 8601	ELECT 22U M 16V
OR	403 042 8803	ELECT 22U M 16V
C3511	403 145 8601	ELECT 22U M 16V
OR	403 042 8803	ELECT 22U M 16V
C3512	403 063 0008	POLYESTER 6800P K 50V
C3513	403 168 6103	MT-POLYEST 0.1U J 50V
C3514	403 001 5003	CERAMIC 2200P K 16V
C3515	403 001 3801	CERAMIC 1500P K 16V
C3516	403 001 8806	CERAMIC 6800P K 16V
C3517	403 145 8601	ELECT 22U M 16V
OR	403 042 8803	ELECT 22U M 16V
C3518	403 145 8601	ELECT 22U M 16V
OR	403 042 8803	ELECT 22U M 16V
C3519	403 175 0903	MT-POLYEST 0.12U J 50V
C3520	403 135 4002	ELECT 47U M 6.3V
C3525	403 069 1207	CERAMIC 1000P K 50V
C3526	403 108 0000	ELECT 0.22U M 50V
C3527	403 001 1609	CERAMIC 0.01U K 16V
C3528	403 109 6308	ELECT 1U M 50V
C3529	403 004 4607	CERAMIC 0.068U K 25V
C3530	403 107 9905	ELECT 10U M 16V
C3531	403 135 7805	ELECT 3.3U M 50V
C3532	403 074 9205	CERAMIC 680P K 50V
C3533	403 069 1207	CERAMIC 1000P K 50V
C3534	403 159 0806	NP-ELECT 33U M 6.3V
C3535	403 069 1207	CERAMIC 1000P K 50V
C3536	403 061 3308	POLYESTER 0.039U J 50V
C3537	403 135 4002	ELECT 47U M 6.3V
C3540	403 063 7700	POLYESTER 0.082U K 50V
C3541	403 070 4105	CERAMIC 120P K 50V
C3550	403 121 9509	CERAMIC 0.1U Z 50V
C3551	403 168 6103	MT-POLYEST 0.1U J 50V
C3552	403 168 6103	MT-POLYEST 0.1U J 50V
C3553	403 168 6103	MT-POLYEST 0.1U J 50V
C3554	403 062 0405	POLYESTER 0.047U K 50V
C3555	403 001 1609	CERAMIC 0.01U K 16V
C3556	403 086 2607	NP-ELECT 1U M 50V
C3557	403 001 1609	CERAMIC 0.01U K 16V
C3558	403 086 2607	NP-ELECT 1U M 50V
C3559	403 057 5101	POLYESTER 1200P J 50V
D3501	407 007 9904	DIODE GMA01-BT
OR	407 012 4406	DIODE 1SS133-T-77
D3502	407 007 9904	DIODE GMA01-BT
OR	407 012 4406	DIODE 1SS133-T-77
D3503	407 007 9904	DIODE GMA01-BT
OR	407 012 4406	DIODE 1SS133-T-77
D3504	407 007 9904	DIODE GMA01-BT
OR	407 012 4406	DIODE 1SS133-T-77
D3506	407 012 4406	DIODE 1SS133-T-77

LOCATION	PARTS NO.	DESCRIPTION
D3506	407 007 9904	DIODE GMA01-BT
D3509	407 012 4406	DIODE 1SS133-T-77
OR	407 007 9904	DIODE GMA01-BT
D3512	407 012 4406	DIODE 1SS133-T-77
OR	407 007 9904	DIODE GMA01-BT
D3513	407 012 4406	DIODE 1SS133-T-77
OR	407 007 9904	DIODE GMA01-BT
D3517	407 012 4406	DIODE 1SS133-T-77
OR	407 007 9904	DIODE GMA01-BT
D3518	407 012 4406	DIODE 1SS133-T-77
OR	407 007 9904	DIODE GMA01-BT
D3519	407 012 4406	DIODE 1SS133-T-77
OR	407 007 9904	DIODE GMA01-BT
D3520	407 012 4406	DIODE 1SS133-T-77
OR	407 007 9904	DIODE GMA01-BT
D3527	407 012 4406	DIODE 1SS133-T-77
OR	407 007 9904	DIODE GMA01-BT
D3528	407 012 4406	DIODE 1SS133-T-77
OR	407 007 9904	DIODE GMA01-BT
D3529	407 012 4406	DIODE 1SS133-T-77
OR	407 007 9904	DIODE GMA01-BT
D3530	407 012 4406	DIODE 1SS133-T-77
OR	407 007 9904	DIODE GMA01-BT
D3534	407 012 4406	DIODE 1SS133-T-77
OR	407 007 9904	DIODE GMA01-BT
D3535	407 012 4406	DIODE 1SS133-T-77
OR	407 007 9904	DIODE GMA01-BT
D3536	407 012 4406	DIODE 1SS133-T-77
OR	407 007 9904	DIODE GMA01-BT
D3539	407 012 4406	DIODE 1SS133-T-77
OR	407 007 9904	DIODE GMA01-BT
D3540	407 012 4406	DIODE 1SS133-T-77
OR	407 007 9904	DIODE GMA01-BT
D3541	407 012 4406	DIODE 1SS133-T-77
OR	407 007 9904	DIODE GMA01-BT
D3542	407 012 4406	DIODE 1SS133-T-77
OR	407 007 9904	DIODE GMA01-BT
D3543	407 012 4406	DIODE 1SS133-T-77
OR	407 007 9904	DIODE GMA01-BT
IC351	409 180 3601	IC LC7418-8086
IC352	409 159 8606	IC LA7122S
OR	409 178 3200	IC LA7124
Q3501	405 011 8401	TR 2SC1740S-DCTP-Q
OR	405 019 2005	TR 2SC536-E-SPA-AC
OR	405 093 0607	TR KSC2785-Y
Q3503	405 019 2005	TR 2SC536-E-SPA-AC
OR	405 011 8401	TR 2SC1740S-DCTP-Q
OR	405 093 0607	TR KSC2785-Y
Q3505	405 019 2005	TR 2SC536-E-SPA-AC
OR	405 011 8401	TR 2SC1740S-DCTP-Q
OR	405 093 0607	TR KSC2785-Y
R3503	401 016 4707	CARBON 22K JA 1/4W
R3504	401 016 4707	CARBON 22K JA 1/4W
R3505	401 016 5704	CARBON 220K JA 1/4W
R3509	401 015 3701	CARBON 18K JA 1/4W
R3510	401 018 4804	CARBON 33K JA 1/4W
R3511	401 012 6903	CARBON 10K JA 1/4W
R3512	401 012 8006	CARBON 100K JA 1/4W
R3513	401 012 8006	CARBON 100K JA 1/4W
R3514	401 018 5702	CARBON 330K JA 1/4W
R3515	401 014 5102	CARBON 15K JA 1/4W
R3516	401 014 6000	CARBON 150K JA 1/4W
R3517	401 014 6000	CARBON 150K JA 1/4W
R3518	401 012 6903	CARBON 10K JA 1/4W
R3519	401 020 2805	CARBON 47K JA 1/4W
R3520	401 020 2805	CARBON 47K JA 1/4W

LOCATION	PARTS NO.	DESCRIPTION
R3521	401 018 5702	CARBON 330K JA 1/4W
R3522	401 014 6000	CARBON 150K JA 1/4W
R3523	401 017 2702	CARBON 27K JA 1/4W
R3527	401 014 6000	CARBON 150K JA 1/4W
R3528	401 012 8006	CARBON 100K JA 1/4W
R3529	401 012 6903	CARBON 10K JA 1/4W
R3534	401 016 3700	CARBON 2.2K JA 1/4W
R3535	401 016 3700	CARBON 2.2K JA 1/4W
R3538	401 012 5609	CARBON 1K JA 1/4W
R3539	401 021 9902	CARBON 620K JA 1/4W
R3540	401 014 6000	CARBON 150K JA 1/4W
R3541	401 018 7508	CARBON 360 JA 1/4W
R3542	401 020 7800	CARBON 510 JA 1/4W
R3543	401 020 7800	CARBON 510 JA 1/4W
R3548	401 012 6903	CARBON 10K JA 1/4W
R3549	401 012 8006	CARBON 100K JA 1/4W
R3550	401 012 6903	CARBON 10K JA 1/4W
R3551	401 013 7206	CARBON 120K JA 1/4W
R3552	401 017 3709	CARBON 270K JA 1/4W
R3553	401 015 4609	CARBON 180K JA 1/4W
R3554	401 012 6903	CARBON 10K JA 1/4W
R3555	401 018 5702	CARBON 330K JA 1/4W
R3560	401 012 5609	CARBON 1K JA 1/4W
R3561	401 015 2605	CARBON 1.8K JA 1/4W
R3563	401 012 5609	CARBON 1K JA 1/4W
R3564	401 012 5609	CARBON 1K JA 1/4W
R3565	401 022 8508	CARBON 750K JA 1/4W
R3566	401 012 8006	CARBON 100K JA 1/4W
R3571	401 012 8006	CARBON 100K JA 1/4W
R3572	401 012 6903	CARBON 10K JA 1/4W
R3575	401 012 6903	CARBON 10K JA 1/4W
R3576	401 023 4509	CARBON 820K JA 1/4W
R3580	401 018 5702	CARBON 330K JA 1/4W
R3581	401 023 7807	CARBON 91K JA 1/4W
R3584	401 012 6903	CARBON 10K JA 1/4W
R3585	401 015 4609	CARBON 180K JA 1/4W
R3590	401 013 6308	CARBON 12K JA 1/4W
R3593	401 018 5702	CARBON 330K JA 1/4W
R3594	401 012 5609	CARBON 1K JA 1/4W
R3595	401 012 5609	CARBON 1K JA 1/4W
VR351	613 001 9110	SEMI VR 220KB
OR	613 097 7953	VR,SEMI 220KB
VR353	613 001 9486	SEMI VR 500KB
OR	613 112 4936	VR,SEMI 500KB
VR354	613 001 9486	SEMI VR 500KB
OR	613 112 4936	VR,SEMI 500KB

POWER SUPPLY CIRCUIT(PW-A)

LOCATION	PARTS NO.	DESCRIPTION
C5401	403 001 1609	CERAMIC 0.01U K 16V (VHR-7540G ONLY)
C5402	403 135 4002	ELECT 47U M 6.3V
D5401	407 007 9904	DIODE GMA01-BT(VHR-7540G ONLY)
OR	407 012 4406	DIODE 1SS133-T-77(VHR-7540G ONLY)
D5402	407 099 5204	ZENER DIODE MTZJ5.1B-T-77 (VHR-7540G ONLY)
D5403	407 053 3109	ZENER DIODE MTZ12A-T-77 (EXCEPT VHR-7540G)
OR	407 099 5709	ZENER DIODE MTZ6.8C-T-77(VHR-7540G)
D5404	407 078 2705	DIODE 1SS244-T-77
D5405	407 078 1104	ZENER DIODE MTZ33A-T-77
D5406	407 053 2706	ZENER DIODE MTZ10C-T-77
D5411	407 004 9709	DIODE DSK10C-BT(VHR-7540G ONLY)
OR	407 005 8701	DIODE ERA15-02-V5(VHR-7540G ONLY)
D5412	407 004 9709	DIODE DSK10C-BT(VHR-7540G ONLY)
OR	407 005 8701	DIODE ERA15-02-V5(VHR-7540G ONLY)
D5413	407 004 9709	DIODE DSK10C-BT(VHR-7540G ONLY)
D5413	407 005 8701	DIODE ERA15-02-V5(VHR-7540G ONLY)
L5401	613 015 2695	HF CHOKE 56UH K(VHR-7540G ONLY)
Q5401	405 088 9103	TR 2SA1703-S-AN
Q5402	405 089 2103	TR 2SC4483-S-AN(EXCEPT VHR-7540G)
OR	405 089 2400	TR 2SC4484-S-AN(VHR-7540G)
Q5403	405 006 7006	TR 2SA984K-E-AA
OR	405 006 7204	TR 2SA984K-F-AA
Q5404	405 006 7006	TR 2SA984K-E-AA
OR	405 006 7204	TR 2SA984K-F-AA
Q5405	405 089 2103	TR 2SC4483-S-AN(VHR-7540G ONLY)
R5401	401 021 8905	CARBON 6.2K JA 1/4W
R5402	401 016 3700	CARBON 2.2K JA 1/4W
R5403	401 012 5609	CARBON 1K JA 1/4W
R5404 ⚠	402 042 1807	FUSIBLE RES 1.5K JA 1/4W (VHR-7500G,7530G,8500SP)
OR ⚠	402 041 6209	FUSIBLE RES 820 JA 1/4W (VHR-7540G,7500EX)
R5405	401 021 2903	CARBON 5.6K JA 1/4W (EXCEPT VHR-7500EX)
OR	401 018 3708	CARBON 3.3K JA 1/4W (VHR-7500EX)
R5406	401 014 5102	CARBON 15K JA 1/4W
R5407	401 019 7705	CARBON 4.3K JA 1/4W
R5408 ⚠	402 004 1906	FUSIBLE RES 47 JA 1/4W
R5409	401 013 6308	CARBON 12K JA 1/4W
R5410	401 014 2804	CARBON 150 JA 1/4W
R5411	401 014 2804	CARBON 150 JA 1/4W
R5412	401 015 3701	CARBON 18K JA 1/4W (VHR-7540G ONLY)
R5413	401 012 6903	CARBON 1K JA 1/4W (VHR-7540G ONLY)

TUNER CIRCUIT(TN-A)

LOCATION	PARTS NO.	DESCRIPTION
B6001	405 000 6104	TR DTC144ES-DCTP(VHR-7500EX ONLY)
OR	405 018 2501	TR 2SC3399-AC(VHR-7500EX ONLY)
B6002	405 003 7603	TR 2SA1345-AC
OR	405 000 2205	TR DTA144ES-DCTP
OR	405 063 9104	TR DTA144EL-TL2
B6003	405 018 2501	TR 2SC3399-AC(EXCEPT VHR-7540G)
OR	405 000 6104	TR DTC144ES-DCTP(EXCEPT VHR-7540G)
C6001	403 002 4708	CERAMIC 0.1U Z 25V (VHR-7500EX ONLY)
C6002	403 121 3002	ELECT 4.7U M 25V (VHR-7500EX ONLY)
C6003	403 109 6308	ELECT 1U M 50V (VHR-7500EX ONLY)
C6004	403 168 6103	MT-POLYEST 0.1U J 50V (VHR-7500EX ONLY)
OR	403 065 8002	MT-POLYEST 0.1U J 63V (VHR-7500EX ONLY)
OR	403 067 5603	MT-COMPO 0.1U J 50V (VHR-7500EX ONLY)
C6005	403 121 3002	ELECT 4.7U M 25V (VHR-7500EX ONLY)
C6006	403 125 5606	ELECT 100U M 16V
C6007	403 143 2809	CERAMIC 0.047U Z 50V (VHR-7500EX ONLY)
C6008	403 109 6308	ELECT 1U M 50V (EXCEPT VHR-7540G)
C6009	403 135 7409	ELECT 22U M 50V
C6010	403 121 9509	CERAMIC 0.1U Z 50V
IC601	409 026 8203	IC L5631
OR	409 057 5103	IC UPC574J

LOCATION	PARTS NO.	DESCRIPTION
IC602	409 148 5005	IC M6M80021P
OR	409 199 5306	IC M6M80011AP(VHR-5300EX ONLY)
Q6001	405 040 0605	TR 2SK222-C(VHR-7500EX ONLY)
OR	405 026 9004	TR 2SK222-D(VHR-7500EX ONLY)
OR	405 027 8709	TR 2SK68A-K(VHR-7500EX ONLY)
OR	405 057 9301	TR 2SK68A-L1(VHR-7500EX ONLY)
Q6002	405 004 4007	TR 2SA608-E-SPA-AC
OR	405 004 4601	TR 2SA608-F-SPA-AC
OR	405 006 1707	TR 2SA933S-TP-Q
OR	405 006 1806	TR 2SA933S-T93-R
OR	405 093 0508	TR KSA1175-Y
Q6003	405 019 2005	TR 2SC536-E-SPA-AC (EXCEPT VHR-7540G)
OR	405 019 2807	TR 2SC536-F-SPA-AC (EXCEPT VHR-7540G)
OR	405 093 0607	TR KSC2785-Y(EXCEPT VHR-7540G)
R6001	401 018 2701	CARBON 330 JA 1/4W
R6002	401 019 0904	CARBON 390 JA 1/4W
R6003	401 012 9201	CARBON 1M JA 1/4W (VHR-7500EX ONLY)
R6004	401 019 3905	CARBON 390K JA 1/4W (VHR-7500EX ONLY)
R6005	401 020 3802	CARBON 470K JA 1/4W (VHR-7500EX ONLY)
R6006	401 019 3905	CARBON 390K JA 1/4W
R6007	401 016 8705	CARBON 240K JA 1/4W
R6008	401 012 5609	CARBON 1K JA 1/4W
R6009	401 012 6903	CARBON 10K JA 1/4W (VHR-7500EX ONLY)
R6010	401 012 6903	CARBON 10K JA 1/4W (EXCEPT VHR-7540G)
R6014	401 015 9406	CARBON 2K JA 1/4W (VHR-7500G,7450G,7530G)
R6015	401 012 6903	CARBON 10K JA 1/4W (EXCEPT VHR-7540G)

RF CONVERTER CIRCUIT(CV-A)

C6601	403 134 8100	ELECT 100U M 6.3V
L6601	613 015 6631	COIL,INDUCTOR 15UHK
OR	613 014 8667	HF CHOKE 15UH K
L6602	613 015 6631	COIL,INDUCTOR 15UHK
OR	613 014 8667	HF CHOKE 15UH K

COMPL,VD-1

COMPL.NO.	613 108 4186	(EXCEPT VHR-8500SP)
B1701	405 029 3504	TR DTC144EK-T96
OR	405 018 1900	TR 2SC3395-TB
C1701	403 069 5601	CERAMIC 0.01U K 50V
C1702	403 009 5807	CERAMIC 100P J 50V
C1703	403 189 2405	ELECT 10U M 16V
C1704	403 068 0409	CERAMIC 0.1U Z 25V
C1705	403 189 2405	ELECT 10U M 16V
C1706	403 069 5601	CERAMIC 0.01U K 50V
D1701	407 007 9904	DIODE GMA01-BT
OR	407 012 4406	DIODE 1SS133-T-77
IC171	409 003 4907	IC BA7025L
J1701	401 037 5004	MT-GLAZE 0.000 ZA 1/10W
Q1701	405 014 4400	TR 2SC2412K-T96-Q
OR	405 014 4509	TR 2SC2412K-T96-R

LOCATION	PARTS NO.	DESCRIPTION
Q1701	405 014 4608	TR 2SC2412K-T96-S
OR	405 015 8407	TR 2SC2812-L5-TB
OR	405 015 8704	TR 2SC2812-L6-TB
R1701	401 038 0800	MT-GLAZE 22K JA 1/10W
R1702	401 037 5608	MT-GLAZE 10K JA 1/10W
R1703	401 038 7700	MT-GLAZE 5.6K JA 1/10W
R1704	401 037 5400	MT-GLAZE 1K JA 1/10W
R1705	401 038 0800	MT-GLAZE 22K JA 1/10W
R1706	401 037 5400	MT-GLAZE 1K JA 1/10W
R1707	401 038 0701	MT-GLAZE 2.2K JA 1/10W
R1708	401 037 8104	MT-GLAZE 150K JA 1/10W
R1709	401 038 5805	MT-GLAZE 430 JA 1/10W
R1710	401 038 0800	MT-GLAZE 22K JA 1/10W
R1711	401 037 5608	MT-GLAZE 10K JA 1/10W
XF171	613 084 1681	FILTER 4.16MHZ B.F
XF172	613 015 8604	CHOKE COIL

COMPL,VP-1

COMPL.NO.	613 110 9681	
B1801	405 063 9708	TR DTC144EL-TL2
B1891	405 000 6104	TR DTC144ES-DCTP
OR	405 018 2501	TR 2SC3399-AC
B1892	405 063 9708	TR DTC144EL-TL2
C1801	403 003 1805	CERAMIC 2200P M 25V
C1802	403 003 7104	CERAMIC 0.033U M 25V
C1803	403 003 7104	CERAMIC 0.033U M 25V
C1804	403 003 1805	CERAMIC 2200P M 25V
C1805	403 003 1805	CERAMIC 2200P M 25V
C1806	403 003 7104	CERAMIC 0.033U M 25V
C1807	403 022 7703	CERAMIC 33P J 50V
C1808	403 003 7104	CERAMIC 0.033U M 25V
C1809	403 003 1805	CERAMIC 2200P M 25V
C1810	403 022 7703	CERAMIC 33P J 50V
C1811	403 191 8709	ELECT 1U M 50V
C1812	403 003 7104	CERAMIC 0.033U M 25V
C1813	403 003 7104	CERAMIC 0.033U M 25V
C1814	403 163 7907	ELECT 47U M 6.3V
C1815	403 001 1906	CERAMIC 0.01U M 16V
C1816	403 069 0309	CERAMIC 1000P J 50V
C1817	403 163 7907	ELECT 47U M 6.3V
C1818	403 001 1906	CERAMIC 0.01U M 16V
C1819	403 001 1906	CERAMIC 0.01U M 16V
C1820	403 001 1906	CERAMIC 0.01U M 16V
C1821	403 001 1906	CERAMIC 0.01U M 16V
C1822	403 001 1906	CERAMIC 0.01U M 16V
C1823	403 072 7500	CERAMIC 330P J 50V
C1824	403 073 2702	CERAMIC 390P J 50V
C1825	403 003 7104	CERAMIC 0.033U M 25V
C1826	403 193 7809	ELECT 100U M 16V
C1827	403 003 3700	CERAMIC 0.022U Z 25V
C1861	403 012 6006	CERAMIC 15P J 50V
C1862	403 028 3402	CERAMIC 56P J 50V
C1863	403 026 2209	CERAMIC 47P J 50V
C1864	403 075 3103	CERAMIC 82P J 50V
C1891	403 012 6006	CERAMIC 15P J 50V
C1892	403 191 8709	ELECT 1U M 50V
C1893	403 069 0309	CERAMIC 1000P J 50V
C1894	403 001 1906	CERAMIC 0.01U M 16V
IC181	409 161 9806	IC LA7321
L1801	613 015 6730	COIL,INDUCTOR 100UHK
L1802	613 015 6730	COIL,INDUCTOR 100UHK
L1803	613 014 0838	COIL,INDUCTOR 6.8UHK
L1804	613 014 0890	COIL,INDUCTOR 22UHK

LOCATION	PARTS NO.	DESCRIPTION
L1805	613 014 0968	COIL,INDUCTOR 82UHK
L1806	613 015 6716	COIL,INDUCTOR 68UHK
Q1801	405 057 6201	TR 2SC4038-Q-TL2
OR	405 057 6409	TR 2SC4038-R-TL2
Q1802	405 082 7204	TR 2SC4039 TL2 Q
R1801	401 021 7007	CARBON 6.8 JA 1/4W
R1802	401 016 1409	CARBON 22 JA 1/4W
R1803	401 013 4106	CARBON 120 JA 1/4W
R1804	401 015 2605	CARBON 1.8K JA 1/4W
R1805	401 012 4404	CARBON 100 JA 1/4W
R1809	401 020 0702	CARBON 470 JA 1/4W
R1810	401 021 1807	CARBON 560 JA 1/4W
R1811	401 020 0702	CARBON 470 JA 1/4W
R1841	401 014 4006	CARBON 1.5K JA 1/4W
R1842	401 014 4006	CARBON 1.5K JA 1/4W
R1843	401 012 5609	CARBON 1K JA 1/4W
R1860	401 016 2505	CARBON 220 JA 1/4W
R1862	401 017 0708	CARBON 270 JA 1/4W
R1891	401 016 1409	CARBON 22 JA 1/4W
R1892	401 012 6903	CARBON 10K JA 1/4W
R1893	401 020 1907	CARBON 4.7K JA 1/4W
R1894	401 018 3708	CARBON 3.3K JA 1/4W
VR181	613 002 0345	SEMI VR 1KB
VR182	613 002 0345	SEMI VR 1KB

COMPL,SY-7

LOCATION	PARTS NO.	DESCRIPTION
COMPL.NO.	613 109 4550	
B3102	405 018 2402	TR 2SC3398-TB
B3104	405 018 2402	TR 2SC3398-TB
C3102	403 191 8808	ELECT 2.2U M 50V
C3103	403 068 0409	CERAMIC 0.1U Z 25V
C3104	403 069 5601	CERAMIC 0.01U K 50V
C3105	403 167 6500	ELECT 33U M 6.3V
C3106	403 068 0409	CERAMIC 0.1U Z 25V
C3108	403 163 7907	ELECT 47U M 6.3V
C3109	403 069 5601	CERAMIC 0.01U K 50V
C3110	403 013 3004	CERAMIC 150P J 50V
C3111	403 069 5601	CERAMIC 0.01U K 50V
C3112	403 069 5601	CERAMIC 0.01U K 50V
C3113	403 069 5601	CERAMIC 0.01U K 50V
C3114	403 069 5601	CERAMIC 0.01U K 50V
C3115	403 155 9407	NP-ELECT 10U M 25V
C3116	403 069 1702	CERAMIC 1000P K 50V
C3117	403 069 5601	CERAMIC 0.01U K 50V
C3118	403 069 5601	CERAMIC 0.01U K 50V
D3101	407 063 9504	ZENER DIODE MTZJ8.2B-T-77
D3102	407 099 5303	ZENER DIODE MTZJ5.6B-T-77
D3103	407 003 3609	DIODE DAN202K-T-96
D3104	407 003 3609	DIODE DAN202K-T-96
IC311	409 168 2503	IC BA10393F
IC312	409 114 4803	IC LB1641
IC313	409 032 3704	IC MN1280-R
OR	409 032 3803	IC MN1280-S
L3101	613 014 1118	COIL,INDUCTOR 18UHJ
Q3101	405 015 9909	TR 2SC2814-F5-TB
OR	405 035 6100	TR 2SC2413K-T96-Q
Q3102	405 015 8902	TR 2SC2812-L7-TB
OR	405 014 4608	TR 2SC2412K-T96-S
Q3103	405 015 8902	TR 2SC2812-L7-TB
OR	405 014 4608	TR 2SC2412K-T96-S
R3101	401 037 5608	MT-GLAZE 10K JA 1/10W
R3102	401 037 8104	MT-GLAZE 150K JA 1/10W
R3103	401 038 0206	MT-GLAZE 20K JA 1/10W
R3104	401 038 0800	MT-GLAZE 22K JA 1/10W
R3105	401 038 7809	MT-GLAZE 56K JA 1/10W
R3106	401 039 0601	MT-GLAZE 820K JA 1/10W
R3107	401 038 2309	MT-GLAZE 270K JA 1/10W
R3108	401 038 2200	MT-GLAZE 27K JA 1/10W
R3109	401 038 0701	MT-GLAZE 2.2K JA 1/10W
R3110	401 038 3702	MT-GLAZE 33K JA 1/10W
R3111	401 038 0800	MT-GLAZE 22K JA 1/10W
R3112	401 037 5608	MT-GLAZE 10K JA 1/10W
R3113	401 038 0800	MT-GLAZE 22K JA 1/10W
R3114	401 037 5608	MT-GLAZE 10K JA 1/10W
R3115	401 037 5608	MT-GLAZE 10K JA 1/10W
R3116	401 037 5608	MT-GLAZE 10K JA 1/10W
R3117	401 037 7909	MT-GLAZE 1.5K JA 1/10W
R3118	401 038 9605	MT-GLAZE 750 JA 1/10W
R3123	401 039 0403	MT-GLAZE 8.2K JA 1/10W
R3124	401 038 0701	MT-GLAZE 2.2K JA 1/10W
R3125	401 037 5400	MT-GLAZE 1K JA 1/10W
R3126	401 038 3504	MT-GLAZE 330 JA 1/10W
R3127	401 038 0602	MT-GLAZE 220 JA 1/10W
R3128	401 038 0602	MT-GLAZE 220 JA 1/10W
R3129	401 038 0909	MT-GLAZE 220K JA 1/10W
R3130	401 038 2200	MT-GLAZE 27K JA 1/10W
R3131	401 038 3702	MT-GLAZE 33K JA 1/10W
R3132	401 038 3702	MT-GLAZE 33K JA 1/10W
R3133	401 038 6505	MT-GLAZE 47K JA 1/10W
R3134	401 038 3702	MT-GLAZE 33K JA 1/10W
R3135	401 037 8203	MT-GLAZE 1.5M JA 1/10W
R3136	401 038 0800	MT-GLAZE 22K JA 1/10W
R3137	401 038 6406	MT-GLAZE 4.7K JA 1/10W
R3138	401 037 5400	MT-GLAZE 1K JA 1/10W
R3139	401 038 0305	MT-GLAZE 200K JA 1/10W
R3140	401 037 5400	MT-GLAZE 1K JA 1/10W
R3141	401 038 0305	MT-GLAZE 200K JA 1/10W
R3142	401 037 5400	MT-GLAZE 1K JA 1/10W
R3143	401 038 6406	MT-GLAZE 4.7K JA 1/10W
R3144	401 038 6406	MT-GLAZE 4.7K JA 1/10W
R3145	401 038 6406	MT-GLAZE 4.7K JA 1/10W
R3146	401 038 6406	MT-GLAZE 4.7K JA 1/10W
R3152	401 037 7909	MT-GLAZE 1.5K JA 1/10W
R3153	401 037 5400	MT-GLAZE 1K JA 1/10W
R3154	401 037 5400	MT-GLAZE 1K JA 1/10W
R3155	401 037 5400	MT-GLAZE 1K JA 1/10W
R3156	401 037 5400	MT-GLAZE 1K JA 1/10W

COMPL,PW-1

LOCATION	PARTS NO.	DESCRIPTION
COMPL.NO.	613 109 4505	(VHR-7500G,7530G)
COMPL.NO.	613 109 4512	(VHR-7500EX,8500SP)
	613 053 8055	FIXER
	613 108 7545	HOLDER,FUSE
C5101	403 110 1705	ELECT 2200U M 25V
OR	403 148 0701	ELECT 2200U M 25V
C5102	403 110 1705	ELECT 2200U M 25V
OR	403 148 0701	ELECT 2200U M 25V
C5103	403 160 6804	ELECT 3300U M 16V
OR	403 158 0500	ELECT 3300U M 16V
C5104	403 157 0006	ELECT 47U M 63V
C5105	403 195 5100	ELECT 47U M 100V
OR	403 155 5805	ELECT 47U M 100V
C5106	403 168 6103	MT-POLYEST 0.1U J 50V
C5107	403 135 9403	ELECT 47U M 35V
C5108	403 107 9905	ELECT 10U M 16V
C5109	403 107 9905	ELECT 10U M 16V
C5110	403 107 9905	ELECT 10U M 16V

LOCATION	PARTS NO.	DESCRIPTION
D5101	407 004 9600	DIODE DSF10TC-BT
D5102	407 004 9600	DIODE DSF10TC-BT
D5103	407 132 7400	DIODE GP30DL-6326
D5104	407 132 7400	DIODE GP30DL-6326
D5105	407 004 9709	DIODE DSK10C-BT
OR	407 088 6502	DIODE MPG06D-PKG3
OR	407 005 8701	DIODE ERA15-02-V5
D5106	407 004 9709	DIODE DSK10C-BT
OR	407 088 6502	DIODE MPG06D-PKG3
OR	407 005 8701	DIODE ERA15-02-V5
D5107	407 004 9709	DIODE DSK10C-BT
OR	407 088 6502	DIODE MPG06D-PKG3
OR	407 005 8701	DIODE ERA15-02-V5
D5108	407 004 9709	DIODE DSK10C-BT
OR	407 088 6502	DIODE MPG06D-PKG3
OR	407 005 8701	DIODE ERA15-02-V5
D5109	407 078 2705	DIODE 1SS244-T-77
D5110	407 078 2705	DIODE 1SS244-T-77
F5001 ⚠	423 004 6708	FUSE 250V0.315A
F5101 ⚠	423 004 3004	FUSE 250V 0.8A
F5102 ⚠	423 005 4901	FUSE 250V 1.6A
F5103 ⚠	423 006 1305	FUSE 250V 2A
F5104 ⚠	423 004 6708	FUSE 250V0.315A
L5001 ⚠	613 080 0664	LF CHOKE(VHR-7500G,7530G)
OR ⚠	613 013 1409	LF CHOKE(VHR-7500G,7530G)
R5101	401 007 8301	CARBON 1.5K JA 1/2W
R5102	401 007 8301	CARBON 1.5K JA 1/2W

COMPL,PW-1

COMPL.NO.	613 110 7922	(VHR-7540G ONLY)
	613 118 1618	HOLDER,FUSE
C5101	403 065 8002	MT-POLYEST 0.1U J 63V
C5102	403 097 6502	ELECT 2200U M 50V
OR	403 135 7706	ELECT 2200U M 50V
C5105	403 157 0006	ELECT 47U M 63V
C5106	403 156 9703	ELECT 22U M 63V
C5108	403 160 7207	ELECT 470U M 16V
C5109	404 049 6908	ELECT 1000U M 10V
C5110	403 044 1703	ELECT 470U M 16V
C5111	403 135 4507	ELECT 1000U M 10V
C5112	403 129 5800	ELECT 22U M 35V
C5113	403 002 4708	CERAMIC 0.1U Z 25V
C5115	403 125 5606	ELECT 100U M 16V
D5101	407 090 2608	DIODE DBF40E
D5102	407 078 2705	DIODE 1SS244-T-77
D5103	407 078 2705	DIODE 1SS244-T-77
D5110	407 050 9104	ZENER DIODE GZB16C
D5111	407 050 8107	ZENER DIODE GZB10C
F5001 ⚠	423 003 3708	FUSE 250V 0.4A
F5101 ⚠	423 004 6708	FUSE 250V0.315A
IC511	409 214 8909	IC STK7576
IC512	409 214 8800	IC SI-3120C
L5001	613 080 0664	LF CHOKE
L5101	613 013 0730	LF CHOKE
L5102	613 013 0730	LF CHOKE
L5103	613 110 4198	COIL,INDUCTOR 10UH K
L5105	613 017 0392	CORE
L5107	613 017 0392	CORE
R5102	401 008 7402	CARBON 2.2K JA 1/2W

LOCATION	PARTS NO.	DESCRIPTION
R5103	401 057 3004	OXIDE-MT 0.22 JA 1W
R5104	401 057 4001	OXIDE-MT 0.33 JA 1W

COMPL,PW-2

COMPL.NO.	613 109 4529	(EXCEPT VHR-7540G)
IC521	409 214 4208	IC STK5446

IF PACK

COMPL.NO.	613 107 0547	(EXCEPT VHR-7530G)
COMPL.NO.	613 108 3585	(VHR-7530G)
C6103	403 021 0200	CERAMIC 3P C 50V
C6104	403 021 0200	CERAMIC 3P C 50V
C6105	403 006 6203	CERAMIC 1P C 50V
C6106	403 006 6203	CERAMIC 1P C 50V
C6107	403 071 8102	CERAMIC 2200P K 50V
C6108	403 069 1702	CERAMIC 1000P K 50V
C6109	403 023 4404	CERAMIC 330P J 50V
C6110	403 071 8102	CERAMIC 2200P K 50V
C6113	403 075 0706	CERAMIC 6800P K 50V
C6114	403 034 1409	CERAMIC 9P C 50V
C6115	403 070 9803	CERAMIC 0.015U K 50V
C6116	403 049 1005	ELECT 1U M 50V
C6117	403 069 1702	CERAMIC 1000P K 50V
C6119	403 075 0706	CERAMIC 6800P K 50V
C6120	403 053 9707	ELECT 4.7U M 35V
C6121	403 075 5305	CERAMIC 8200P K 50V
C6122	403 041 9603	ELECT 10U M 16V
C6123	403 075 0706	CERAMIC 6800P K 50V
C6124	403 069 5601	CERAMIC 0.01U K 50V
C6125	403 033 4500	CERAMIC 82P J 50V
C6127	403 022 8205	CERAMIC 33P J 50V
C6128	403 075 0706	CERAMIC 6800P K 50V
C6129	403 043 9700	ELECT 47U M 16V
C6130	403 017 0900	CERAMIC 20P J 50V (EXCEPT VHR-7530G)
OR	403 013 7903	CERAMIC 16P J 50V (VHR-7530G)
C6133	403 014 3409	CERAMIC 18P J 50V
C6134	403 026 2803	CERAMIC 47P J 50V
C6137	403 033 4708	CERAMIC 82P J 50V
C6138	403 075 0706	CERAMIC 6800P K 50V
C6139	403 047 9201	ELECT 0.1U M 50V
C6141	403 069 5601	CERAMIC 0.01U K 50V
C6142	403 075 0706	CERAMIC 6800P K 50V
C6143	403 012 6808	CERAMIC 15P J 50V
IC611	409 019 3307	IC LA7530N
L6102	613 014 0746	HF CHOKE 1.2UH M
L6103	613 098 8393	COIL,CHOKE 1.2UH
L6105	613 014 0869	HF CHOKE 12UH K
L6106	613 014 0869	HF CHOKE 12UH K(EXCEPT VHR-7530G)
OR	613 014 0852	HF CHOKE 10UH K(VHR-7530G)
L6107	613 014 0869	HF CHOKE 12UH K
L6108	613 014 0913	HF CHOKE 33UH K
L6109	613 014 0845	HF CHOKE 8.2UH K
Q6101	405 015 5505	TR 2SC2757-T1B-T33
Q6102	405 002 0209	TR 2SA1037K-Q
Q6103	405 021 2406	TR 2SD1048-X7-TB
R6101	401 037 7206	MT-GLAZE 130 JA 1/10W
R6102	401 014 2804	CARBON 150 JA 1/4W
R6103	401 038 0602	MT-GLAZE 220 JA 1/10W
R6104	401 037 7800	MT-GLAZE 150 JA 1/10W
R6105	401 039 0205	MT-GLAZE 82 JA 1/10W
R6106	401 038 9704	MT-GLAZE 7.5K JA 1/10W

LOCATION	PARTS NO.	DESCRIPTION
R6107	401 037 7909	MT-GLAZE 1.5K JA 1/10W
R6108	401 037 5400	MT-GLAZE 1K JA 1/10W
R6109	401 038 0503	MT-GLAZE 22 JA 1/10W
R6110	401 037 7909	MT-GLAZE 1.5K JA 1/10W
R6111	401 038 6307	MT-GLAZE 470 JA 1/10W
R6112	401 038 2002	MT-GLAZE 270 JA 1/10W
R6113	401 038 0701	MT-GLAZE 2.2K JA 1/10W
R6114	401 038 7205	MT-GLAZE 5.1K JA 1/10W
R6115	401 037 9200	MT-GLAZE 1.8K JA 1/10W
R6116	401 038 0800	MT-GLAZE 22K JA 1/10W
R6117	401 012 5609	CARBON 1K JA 1/4W
R6118	401 038 4105	MT-GLAZE 3.6K JA 1/10W
R6119	401 037 5400	MT-GLAZE 1K JA 1/10W
R6120	401 037 7305	MT-GLAZE 1.3K JA 1/10W
R6121	401 038 2002	MT-GLAZE 270 JA 1/10W
R6124	401 038 6406	MT-GLAZE 4.7K JA 1/10W (EXCEPT VHR-7530G)
OR	401 038 7700	MT-GLAZE 5.6K JA 1/10W (VHR-7530G)
R6126	401 037 7800	MT-GLAZE 150 JA 1/10W
R6128	401 037 5202	MT-GLAZE 100 JA 1/10W
R6129	401 038 3603	MT-GLAZE 3.3K JA 1/10W
R6130	401 037 5202	MT-GLAZE 100 JA 1/10W
R6132	401 037 7503	MT-GLAZE 130K JA 1/10W (EXCEPT VHR-7530G)
OR	401 038 7809	MT-GLAZE 56K JA 1/10W (VHR-7530G)
R6133	401 037 5400	MT-GLAZE 1K JA 1/10W
R6134	401 012 6903	CARBON 10K JA 1/4W (EXCEPT VHR-7530G)
OR	401 017 9206	CARBON 3K JA 1/4W (VHR-7530G)
R6135	401 037 8104	MT-GLAZE 150K JA 1/10W (EXCEPT VHR-7530G)
OR	401 038 9308	MT-GLAZE 68K JA 1/10W (VHR-7530G)
R6136	401 038 0008	MT-GLAZE 200 JA 1/10W
R6137	401 037 7800	MT-GLAZE 150 JA 1/10W (EXCEPT VHR-7530G)
OR	401 037 8500	MT-GLAZE 160 JA 1/10W (VHR-7530G)
R6138	401 037 7800	MT-GLAZE 150 JA 1/10W
T6101	613 098 8355	TRANS,IF
T6102	613 098 8362	TRANS,IF
T6103	613 098 8379	TRANS,IF
T6104	613 098 8386	TRANS,IF
VR611	613 001 9035	SEMI VR 10KB
XF611	421 002 9509	SAW F TSF1338L
XF612	613 084 1728	FILTER
XF613	613 110 1050	FILTER
XF614	613 084 1674	FILTER
XF615	613 098 8317	DISCR,CERAMIC 5.74M

COMPL,TN-7

LOCATION	PARTS NO.	DESCRIPTION
COMPL.NO.	613 109 4420	(EXCEPT VHR-7500EX)
COMPL.NO.	613 109 1030	(VHR-7500EX)
B6901	405 018 1900	TR 2SC3395-TB
OR	405 029 3504	TR DTC144EK-T96
C6901	403 068 0409	CERAMIC 0.1U Z 25V
C6902	403 189 2405	ELECT 10U M 16V
C6903	403 072 3403	CERAMIC 0.022U Z 50V
C6904	403 193 8400	ELECT 0.22U M 50V
C6921	403 068 0409	CERAMIC 0.1U Z 25V (VHR-7500EX ONLY)
C6922	403 014 9203	CERAMIC 180P J 50V (VHR-7500EX ONLY)
C6923	403 069 1702	CERAMIC 1000P K 50V (VHR-7500EX ONLY)
C6924	403 168 6202	MT-POLYEST 0.33U J 50V (VHR-7500EX ONLY)
OR	403 115 1007	MT-POLYEST 0.33U J 63V (VHR-7500EX ONLY)
OR	403 067 7300	MT-COMPO 0.33U J 50V (VHR-7500EX ONLY)
C6925	403 184 9805	MT-POLYEST 0.22U J 50V (VHR-7500EX ONLY)
OR	403 065 8101	MT-POLYEST 0.22U J 63V (VHR-7500EX ONLY)
OR	403 067 6709	MT-COMPO 0.22U J 50V (VHR-7500EX ONLY)
D6901	407 004 0706	DIODE DCB015-TB
OR	407 003 3609	DIODE DAN202K-T-96
D6902	407 003 5108	DIODE DA204K-T96
IC691	409 019 6209	IC LA7910(VHR-7500EX ONLY)
J6901	401 037 5004	MT-GLAZE 0.000 ZA 1/10W
Q6901	405 015 8308	TR 2SC2812-L4-TB
OR	405 015 8407	TR 2SC2812-L5-TB
OR	405 014 4400	TR 2SC2412K-T96-Q
OR	405 014 4509	TR 2SC2412K-T96-R
Q6902	405 030 7201	TR 2SA1338-4-TB
OR	405 030 7300	TR 2SA1338-5-TB
Q6903	405 015 8308	TR 2SC2812-L4-TB
OR	405 015 8407	TR 2SC2812-L5-TB
OR	405 014 4400	TR 2SC2412K-T96-Q
OR	405 014 4509	TR 2SC2412K-T96-R
Q6921	405 084 8209	TR 2SC2960-F-SPA-AC (VHR-7500EX ONLY)
OR	405 084 8308	TR 2SC2960-G-SPA-AC (VHR-7500EX ONLY)
R6901	401 037 5400	MT-GLAZE 1K JA 1/10W
R6902	401 038 3504	MT-GLAZE 330 JA 1/10W
R6903	401 038 8509	MT-GLAZE 620 JA 1/10W
R6904	401 037 5608	MT-GLAZE 10K JA 1/10W
R6905	401 038 3801	MT-GLAZE 330K JA 1/10W
R6906	401 037 5608	MT-GLAZE 10K JA 1/10W
R6907	401 038 3603	MT-GLAZE 3.3K JA 1/10W
R6908	401 039 0205	MT-GLAZE 82 JA 1/10W
R6909	401 037 5400	MT-GLAZE 1K JA 1/10W
R6910	401 038 7106	MT-GLAZE 510 JA 1/10W
R6911	401 038 7700	MT-GLAZE 5.6K JA 1/10W
R6912	401 038 5102	MT-GLAZE 3.9K JA 1/10W
R6921	401 038 5102	MT-GLAZE 3.9K JA 1/10W (VHR-7500EX ONLY)
R6922	401 038 3702	MT-GLAZE 33K JA 1/10W (VHR-7500EX ONLY)
R6923	401 037 5608	MT-GLAZE 10K JA 1/10W (VHR-7500EX ONLY)
R6924	401 037 5608	MT-GLAZE 10K JA 1/10W (VHR-7500EX ONLY)
R6925	401 037 9309	MT-GLAZE 18K JA 1/10W (VHR-7500EX ONLY)
R6926	401 037 8005	MT-GLAZE 15K JA 1/10W (VHR-7500EX ONLY)
R6927	401 037 6803	MT-GLAZE 12K JA 1/10W (VHR-7500EX ONLY)
T6901	613 109 0958	TRANS,IF
OR	613 109 0965	TRANS,IF

LOCATION	PARTS NO.	DESCRIPTION
COMPL,TM-1		
COMPL.NO.	613 112 5056	(VHR-7500G,8500SP)
COMPL.NO.	613 112 5063	(VHR-7540G)
COMPL.NO.	613 114 3456	(VHR-7530G)
COMPL.NO.	613 112 5070	(VHR-7500EX)
	613 022 0875	HOLDER
A7101	613 084 3197	FLUORESCENT TUBE
C7102	403 014 2501	CERAMIC 18P J 50V
C7103	403 017 0108	CERAMIC 20P J 50V
C7104	403 001 1609	CERAMIC 0.01U K 16V
C7105	403 139 1601	ELECT 22U M 16V
C7106	403 001 1609	CERAMIC 0.01U K 16V
C7107	403 001 1609	CERAMIC 0.01U K 16V
C7108	403 139 2608	ELECT 0.47U M 50V
C7111	403 121 9509	CERAMIC 0.1U Z 50V
C7113	403 139 1502	ELECT 10U M 16V
D7101	407 120 5807	DIODE AK04-V2
D7103	407 007 9904	DIODE GMA01-BT
OR	407 012 4406	DIODE 1SS133-T-77
D7104	407 007 9904	DIODE GMA01-BT
OR	407 012 4406	DIODE 1SS133-T-77
D7105	407 007 9904	DIODE GMA01-BT
OR	407 012 4406	DIODE 1SS133-T-77
D7106	407 007 9904	DIODE GMA01-BT
OR	407 012 4406	DIODE 1SS133-T-77
D7107	407 007 9904	DIODE GMA01-BT
OR	407 012 4406	DIODE 1SS133-T-77
D7108	407 007 9904	DIODE GMA01-BT
OR	407 012 4406	DIODE 1SS133-T-77
D7110	407 007 9904	DIODE GMA01-BT
OR	407 012 4406	DIODE 1SS133-T-77
D7120	407 007 9904	DIODE GMA01-BT(VHR-7530G ONLY)
OR	407 012 4406	DIODE 1SS133-T-77(VHR-7530G ONLY)
D7123	407 007 9904	DIODE GMA01-BT
OR	407 012 4406	DIODE 1SS133-T-77
D7125	407 007 9904	DIODE GMA01-BT
OR	407 012 4406	DIODE 1SS133-T-77
IC711	409 214 4000	IC M50959-292SP(EXCEPT VHR-7500EX)
OR	409 216 2905	IC M50958-294SP(VHR-7500EX)
IC712	409 032 3308	IC MN1280-L
R7101	401 012 9201	CARBON 1M JA 1/4W
R7102	401 110 6201	CARBON 10M JA 1/4W
R7103	401 018 5702	CARBON 330K JA 1/4W
R7104	401 012 5609	CARBON 1K JA 1/4W
R7105	401 012 6903	CARBON 10K JA 1/4W
R7106	401 012 5609	CARBON 1K JA 1/4W
R7107	401 012 6903	CARBON 10K JA 1/4W
R7108	401 012 5609	CARBON 1K JA 1/4W
R7109	401 012 6903	CARBON 10K JA 1/4W
R7110	401 012 5609	CARBON 1K JA 1/4W
R7111	401 012 6903	CARBON 10K JA 1/4W
R7112	401 012 6903	CARBON 10K JA 1/4W
R7114	401 012 6903	CARBON 10K JA 1/4W
R7115	401 012 6903	CARBON 10K JA 1/4W
R7116	401 016 4707	CARBON 22K JA 1/4W
R7117	401 012 6903	CARBON 10K JA 1/4W
R7118	401 012 5609	CARBON 1K JA 1/4W
R7119	401 012 5609	CARBON 1K JA 1/4W
R7121	401 012 6903	CARBON 10K JA 1/4W
R7122	401 012 5609	CARBON 1K JA 1/4W
R7123	401 012 5609	CARBON 1K JA 1/4W
R7124	401 018 4804	CARBON 33K JA 1/4W
R7126	401 012 6903	CARBON 10K JA 1/4W

LOCATION	PARTS NO.	DESCRIPTION
R7127	401 012 6903	CARBON 10K JA 1/4W
R7132	401 012 6903	CARBON 10K JA 1/4W
R7133	401 018 5702	CARBON 330K JA 1/4W
RR711	613 094 0421	IR RECEIVER PACK
S7101	613 006 3649	PUSH SWITCH,PLAY
OR	613 079 4130	SW,PUSH,PLAY
OR	613 092 1734	SW,PUSH,PLAY
OR	613 092 0751	SW,PUSH,PLAY
S7102	613 006 3649	PUSH SWITCH,STOP
OR	613 079 4130	SW,PUSH,STOP
OR	613 092 1734	SW,PUSH,STOP
OR	613 092 0751	SW,PUSH,STOP
S7103	613 006 3649	PUSH SWITCH,PAUSE
OR	613 079 4130	SW,PUSH,PAUSE
OR	613 092 1734	SW,PUSH,PAUSE
OR	613 092 0751	SW,PUSH,PAUSE
S7104	613 006 3700	PUSH SWITCH,TAPE SPEED
OR	613 079 4178	SW,PUSH,TAPE SPEED
OR	613 093 8596	SW,PUSH,TAPE SPEED
OR	613 093 8602	SW,PUSH,TAPE SPEED
S7106	613 006 3700	PUSH SWITCH,UP
OR	613 079 4178	SW,PUSH,UP
OR	613 093 8596	SW,PUSH,UP
OR	613 093 8602	SW,PUSH,UP
S7108	613 006 3700	PUSH SWITCH,TR+/FT+
OR	613 079 4178	SW,PUSH,TR+/FT+
OR	613 093 8596	SW,PUSH,TR+/FT+
OR	613 093 8602	SW,PUSH,TR+/FT+
S7113	613 006 3649	PUSH SWITCH,REC
OR	613 079 4130	SW,PUSH,REC
OR	613 092 1734	SW,PUSH,REC
OR	613 092 0751	SW,PUSH,REC
S7118	613 006 3700	PUSH SWITCH,DOWN
OR	613 079 4178	SW,PUSH,DOWN
OR	613 093 8596	SW,PUSH,DOWN
OR	613 093 8602	SW,PUSH,DOWN
S7120	613 006 3700	PUSH SWITCH,TR-/FT-
OR	613 079 4178	SW,PUSH,TR-/FT-
OR	613 093 8596	SW,PUSH,TR-/FT-
OR	613 093 8602	SW,PUSH,TR-/FT-
S7125	613 006 3649	PUSH SWITCH,REW
OR	613 079 4130	SW,PUSH,REW
OR	613 092 1734	SW,PUSH,REW
OR	613 092 0751	SW,PUSH,REW
S7126	613 006 3649	PUSH SWITCH,FF
OR	613 079 4130	SW,PUSH,FF
OR	613 092 1734	SW,PUSH,FF
OR	613 092 0751	SW,PUSH,FF
S7129	613 006 3700	PUSH SWITCH,PRESET
OR	613 079 4178	SW,PUSH,PRESET
OR	613 093 8596	SW,PUSH,PRESET
OR	613 093 8602	SW,PUSH,PRESET
S7130	613 006 3700	PUSH SWITCH,OK
OR	613 079 4178	SW,PUSH,OK
OR	613 093 8596	SW,PUSH,OK
OR	613 093 8602	SW,PUSH,OK
S7137	613 006 3700	PUSH SWITCH,ALL CLEAR
OR	613 079 4178	SW,PUSH,ALL CLEAR
OR	613 093 8596	SW,PUSH,ALL CLEAR
OR	613 093 8602	SW,PUSH,ALL CLEAR
X7101	613 089 4069	RESONATOR,CERAMIC 6MHZ
OR	613 108 9570	RESONATOR,CERAMIC 6MHZ
X7102	613 109 0972	OSC,CRYSTAL 32KHZ

COMPL,TM-2

LOCATION	PARTS NO.	DESCRIPTION
COMPL.NO.	613 108 9761	
S7114	613 006 3649	PUSH SWITCH,EJECT
OR	613 079 4130	SW,PUSH,EJECT
OR	613 092 1734	SW,PUSH,EJECT
OR	613 092 0751	SW,PUSH,EJECT
S7115	613 006 3649	PUSH SWITCH,POWER
OR	613 079 4130	SW,PUSH,POWER
OR	613 092 1734	SW,PUSH,POWER
OR	613 092 0751	SW,PUSH,POWER
VR771	613 079 2495	VR,ROTARY 10KB

COMPL,VPT UNIT

LOCATION	PARTS NO.	DESCRIPTION
COMPL.NO.	613 111 3589	(VHR-7540G ONLY)
B7602	405 018 2402	TR 2SC3398-TB
B7603	405 003 7405	TR 2SA1344-TB
C7601	403 155 2804	DL-ELECT 0.047F Z 5.5V
C7602	403 041 2703	ELECT 47U M 10V
C7603	403 039 3507	ELECT 470U M 6.3V
C7604	403 069 9500	CERAMIC 0.01U Z 50V
C7605	403 069 9500	CERAMIC 0.01U Z 50V
C7606	403 069 9500	CERAMIC 0.01U Z 50V
C7609	403 041 9405	ELECT 10U M 16V
C7610	403 069 9500	CERAMIC 0.01U Z 50V
C7611	403 069 9500	CERAMIC 0.01U Z 50V
C7640	403 012 6907	CERAMIC 15P J 50V
C7642	403 069 9500	CERAMIC 0.01U Z 50V
C7643	403 069 9500	CERAMIC 0.01U Z 50V
C7644	403 041 2703	ELECT 47U M 10V
C7645	403 069 9500	CERAMIC 0.01U Z 50V
C7646	403 043 9106	ELECT 47U M 16V
C7651	403 161 6902	NP-ELECT 2.2U M 50V
C7652	403 012 6907	CERAMIC 15P J 50V
C7653	403 069 1702	CERAMIC 1000P K 50V
C7654	403 026 7600	CERAMIC 470P J 50V
C7655	403 072 1607	CERAMIC 0.022U K 50V
C7656	403 020 5602	CERAMIC 270P J 50V
C7657	403 009 5807	CERAMIC 100P J 50V
C7658	403 012 6907	CERAMIC 15P J 50V
C7659	403 020 0508	CERAMIC 27P J 50V
C7660	403 067 6709	MT-COMPO 0.22U J 50V
C7661	403 130 3604	CERAMIC 0.047U K 25V
C7662	403 130 3604	CERAMIC 0.047U K 25V
C7663	403 049 0800	ELECT 1U M 50V
C7664	403 073 1200	CERAMIC 0.033U K 50V
C7665	403 014 3508	CERAMIC 18P J 50V
C7666	403 018 0602	CERAMIC 22P J 50V
C7667	403 018 7502	CERAMIC 220P J 50V
C7668	403 075 2304	CERAMIC 0.068U Z 50V
C7669	403 043 9601	ELECT 47U M 16V
C7670	403 069 9500	CERAMIC 0.01U Z 50V
C7671	403 069 9500	CERAMIC 0.01U Z 50V
C7672	403 041 2703	ELECT 47U M 10V
C7673	403 069 9500	CERAMIC 0.01U Z 50V
C7674	403 042 8308	ELECT 22U M 16V
C7675	403 042 8308	ELECT 22U M 16V
C7676	403 042 8308	ELECT 22U M 16V
C7677	403 069 5601	CERAMIC 0.01U K 50V
C7678	403 018 7502	CERAMIC 220P J 50V
C7679	403 027 1300	CERAMIC 5P C 50V
C7680	403 047 9003	ELECT 0.1U M 50V
C7681	403 011 5000	CERAMIC 120P J 50V
C7682	403 041 9405	ELECT 10U M 16V
C7683	403 069 9500	CERAMIC 0.01U Z 50V
C7684	403 047 9003	ELECT 0.1U M 50V

LOCATION	PARTS NO.	DESCRIPTION
C7685	403 047 9003	ELECT 0.1U M 50V
C7686	403 069 5601	CERAMIC 0.01U K 50V
C7687	403 069 1702	CERAMIC 1000P K 50V
C7688	403 069 5601	CERAMIC 0.01U K 50V
C7689	403 085 5203	NP-ELECT 22U M 16V
C7690	403 041 9405	ELECT 10U M 16V
C7692	403 042 3006	ELECT 100U M 16V
C7693	403 042 3006	ELECT 100U M 16V
C7694	403 042 3006	ELECT 100U M 16V
C7697	403 105 9501	CERAMIC 1000P J 50V
CT761	613 002 6378	TRIMMER
D7602	407 007 9904	DIODE GMA01-BT
OR	407 012 4406	DIODE 1SS133-T-77
D7603	407 004 0706	DIODE DCB015-TB
OR	407 003 3609	DIODE DAN202K-T-96
D7657	407 004 0706	DIODE DCB015-TB
OR	407 003 3609	DIODE DAN202K-T-96
D7658	407 004 0706	DIODE DCB015-TB
OR	407 003 3609	DIODE DAN202K-T-96
D7659	407 004 0706	DIODE DCB015-TB
OR	407 003 3609	DIODE DAN202K-T-96
D7660	407 099 4702	ZENER DIODE MTZJ4.3A-T-77
IC761	409 120 6402	IC 8031AH
IC762	410 100 7005	IC TMS27PC512-20N.S07
IC763	409 175 8307	IC LH5164LN-10
OR	409 194 6100	IC SRM2264LC-10
OR	409 194 6209	IC SRM2264LC-12
OR	409 225 6000	IC LH5164N-10L
IC764	409 052 6907	IC TC74HC373P
OR	409 067 5506	IC LC74HC373
IC765	409 032 3704	IC MN1280-R
IC766	409 184 0507	IC SDA5231
OR	409 107 8108	IC SAA5231
IC767	409 196 0304	IC SDA5243
OR	409 211 2603	IC SAA5243P/E
IC768	409 175 8307	IC LH5164LN-10
OR	409 194 6100	IC SRM2264LC-10
OR	409 194 6209	IC SRM2264LC-12
OR	409 225 6000	IC LH5164N-10L
IC769	409 184 0408	IC MC1377
IC770	409 168 8703	IC NJM2235D
L7601	613 015 6112	HF CHOKE 18UH J
L7602	613 015 6112	HF CHOKE 18UH J
L7603	613 015 6112	HF CHOKE 18UH J
L7604	613 015 6112	HF CHOKE 18UH J
L7651	613 014 0876	HF CHOKE 15UH K
PR761	613 000 2556	CIRCUIT PROTECTOR
Q7601	405 015 8407	TR 2SC2812-L5-TB
OR	405 015 8704	TR 2SC2812-L6-TB
Q7602	405 015 8407	TR 2SC2812-L5-TB
OR	405 015 8704	TR 2SC2812-L6-TB
Q7651	405 002 6508	TR 2SA1179-M5-TB
OR	405 002 6706	TR 2SA1179-M6-TB
Q7653	405 015 8407	TR 2SC2812-L5-TB
OR	405 015 8704	TR 2SC2812-L6-TB
Q7654	405 002 6508	TR 2SA1179-M5-TB
OR	405 002 6706	TR 2SA1179-M6-TB
Q7655	405 002 6508	TR 2SA1179-M5-TB
OR	405 002 6706	TR 2SA1179-M6-TB
Q7656	405 002 6508	TR 2SA1179-M5-TB
OR	405 002 6706	TR 2SA1179-M6-TB
Q7657	405 015 8407	TR 2SC2812-L5-TB
OR	405 015 8704	TR 2SC2812-L6-TB

LOCATION	PARTS NO.	DESCRIPTION
Q7658	405 002 6508	TR 2SA1179-M5-TB
OR	405 002 6706	TR 2SA1179-M6-TB
Q7659	405 002 6508	TR 2SA1179-M5-TB
OR	405 002 6706	TR 2SA1179-M6-TB
Q7660	405 015 8407	TR 2SC2812-L5-TB
OR	405 015 8704	TR 2SC2812-L6-TB
Q7661	405 015 8407	TR 2SC2812-L5-TB
OR	405 015 8704	TR 2SC2812-L6-TB
R7601	401 037 5400	MT-GLAZE 1K JA 1/10W
R7602	401 037 5400	MT-GLAZE 1K JA 1/10W
R7603	401 037 5400	MT-GLAZE 1K JA 1/10W
R7604	401 037 5400	MT-GLAZE 1K JA 1/10W
R7605	401 038 3702	MT-GLAZE 33K JA 1/10W
R7606	401 038 3702	MT-GLAZE 33K JA 1/10W
R7607	401 037 5608	MT-GLAZE 10K JA 1/10W
R7615	401 037 5608	MT-GLAZE 10K JA 1/10W
R7616	401 037 5608	MT-GLAZE 10K JA 1/10W
R7617	401 037 5608	MT-GLAZE 10K JA 1/10W
R7618	401 037 5608	MT-GLAZE 10K JA 1/10W
R7620	401 038 3603	MT-GLAZE 3.3K JA 1/10W
R7621	401 038 6406	MT-GLAZE 4.7K JA 1/10W
R7622	401 037 5202	MT-GLAZE 100 JA 1/10W
R7623	401 037 6704	MT-GLAZE 1.2K JA 1/10W
R7624	401 038 9001	MT-GLAZE 680 JA 1/10W
R7625	401 038 7106	MT-GLAZE 510 JA 1/10W
R7626	401 037 5608	MT-GLAZE 10K JA 1/10W
R7627	401 037 5400	MT-GLAZE 1K JA 1/10W
R7629	401 038 6406	MT-GLAZE 4.7K JA 1/10W
R7631	401 038 6406	MT-GLAZE 4.7K JA 1/10W
R7633	401 037 9200	MT-GLAZE 1.8K JA 1/10W
R7634	401 038 2200	MT-GLAZE 27K JA 1/10W
R7635	401 037 8005	MT-GLAZE 15K JA 1/10W
R7636	401 039 0601	MT-GLAZE 820K JA 1/10W
R7637	401 038 2309	MT-GLAZE 270K JA 1/10W
R7638	401 037 5608	MT-GLAZE 10K JA 1/10W
R7640	401 038 9506	MT-GLAZE 75 JA 1/10W
R7641	401 037 9101	MT-GLAZE 180 JA 1/10W
R7642	401 038 0701	MT-GLAZE 2.2K JA 1/10W
R7643	401 038 5904	MT-GLAZE 4.3K JA 1/10W
R7644	401 037 5608	MT-GLAZE 10K JA 1/10W
R7645	401 037 5202	MT-GLAZE 100 JA 1/10W
R7646	401 037 9200	MT-GLAZE 1.8K JA 1/10W
R7649	401 038 7809	MT-GLAZE 56K JA 1/10W
R7651	401 037 6704	MT-GLAZE 1.2K JA 1/10W
R7652	401 038 3603	MT-GLAZE 3.3K JA 1/10W
R7653	401 037 5400	MT-GLAZE 1K JA 1/10W
R7654	401 038 3504	MT-GLAZE 330 JA 1/10W
R7655	401 038 7809	MT-GLAZE 56K JA 1/10W
R7659	401 037 5400	MT-GLAZE 1K JA 1/10W
R7660	401 037 5400	MT-GLAZE 1K JA 1/10W
R7661	401 037 5608	MT-GLAZE 10K JA 1/10W
R7662	401 038 5003	MT-GLAZE 390 JA 1/10W
R7666	401 037 5202	MT-GLAZE 100 JA 1/10W
R7668	401 037 9200	MT-GLAZE 1.8K JA 1/10W
R7669	401 038 2002	MT-GLAZE 270 JA 1/10W
R7670	401 038 2002	MT-GLAZE 270 JA 1/10W
R7671	401 038 2002	MT-GLAZE 270 JA 1/10W
R7672	401 038 9001	MT-GLAZE 680 JA 1/10W
R7673	401 037 5400	MT-GLAZE 1K JA 1/10W
R7674	401 038 4006	MT-GLAZE 360 JA 1/10W
R7675	401 038 8509	MT-GLAZE 620 JA 1/10W
R7676	401 037 9101	MT-GLAZE 180 JA 1/10W
R7677	401 038 9506	MT-GLAZE 75 JA 1/10W
R7678	401 038 9001	MT-GLAZE 680 JA 1/10W
R7679	401 037 5400	MT-GLAZE 1K JA 1/10W
R7680	401 038 4006	MT-GLAZE 360 JA 1/10W
R7681	401 038 8509	MT-GLAZE 620 JA 1/10W
R7682	401 037 9101	MT-GLAZE 180 JA 1/10W

LOCATION	PARTS NO.	DESCRIPTION
R7683	401 038 9506	MT-GLAZE 75 JA 1/10W
R7693	401 038 9001	MT-GLAZE 680 JA 1/10W
R7694	401 037 5400	MT-GLAZE 1K JA 1/10W
R7695	401 038 4006	MT-GLAZE 360 JA 1/10W
R7696	401 038 8509	MT-GLAZE 620 JA 1/10W
R7697	401 037 9101	MT-GLAZE 180 JA 1/10W
R7698	401 038 9506	MT-GLAZE 75 JA 1/10W
X7601	613 099 3083	RESONATOR,CERAMIC 12MHZ
X7651	613 098 5088	OSC,CRYSTAL 13.875MHZ
X7652	613 099 3090	RESONATOR,CERAMIC 6MHZ
X7653	613 002 7818	CRYSTAL 4.433619MHZ 16PF
XF761	613 103 3917	FILTER,4.43MHZ
XF762	613 103 3924	FILTER,3MHZ

COMPL,TM-8

COMPL.NO.	613 108 5534	(VHR-7500G,7530G,7540G)
C7802	403 013 3103	CERAMIC 150P J 50V
C7803	403 067 7300	MT-COMPO 0.33U J 50V
OR	403 115 1007	MT-POLYEST 0.33U J 63V
OR	403 168 6202	MT-POLYEST 0.33U J 50V
C7804	403 057 2407	POLYESTER 0.1U J 50V
C7805	403 068 0409	CERAMIC 0.1U Z 25V
C7806	403 193 7502	ELECT 22U M 6.3V
IC781	409 148 5104	IC SDA5642
Q7801	405 015 8407	TR 2SC2812-L5-TB
OR	405 015 8704	TR 2SC2812-L6-TB
OR	405 014 4400	TR 2SC2412K-T96-Q
OR	405 014 4509	TR 2SC2412K-T96-R
R7801	401 038 6307	MT-GLAZE 470 JA 1/10W
R7802	401 037 5400	MT-GLAZE 1K JA 1/10W
R7803	401 037 5400	MT-GLAZE 1K JA 1/10W
R7804	401 037 9101	MT-GLAZE 180 JA 1/10W
R7805	401 038 0701	MT-GLAZE 2.2K JA 1/10W
R7806	401 037 5806	MT-GLAZE 1M JA 1/10W
R7807	401 039 0601	MT-GLAZE 820K JA 1/10W
R7808	401 037 5707	MT-GLAZE 100K JA 1/10W
R7809	401 037 5608	MT-GLAZE 10K JA 1/10W
R7810	401 037 7008	MT-GLAZE 1.2M JA 1/10W
R7811	401 037 5202	MT-GLAZE 100 JA 1/10W
R7812	401 038 7700	MT-GLAZE 5.6K JA 1/10W

COMPL,TB-1

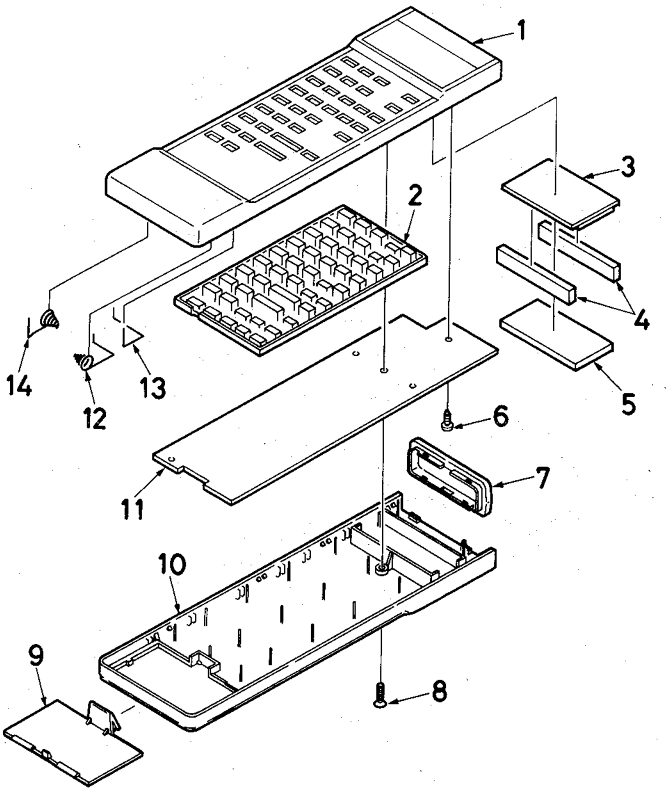
COMPL.NO.	613 111 3176	(VHR-7500G,7530G)
COMPL.NO.	613 111 3183	(VHR-7540G)
COMPL.NO.	613 111 3169	(VHR-7500EX,8500SP)
B8611	405 018 2501	TR 2SC3399-AC
OR	405 000 6104	TR DTC144ES-DCTP
C8521	403 069 1207	CERAMIC 1000P K 50V (VHR-7500G,7530G,7540G)
C8522	403 069 1207	CERAMIC 1000P K 50V (VHR-7500G,7530G,7540G)
C8601	403 139 1007	ELECT 47U M 6.3V
C8602	403 139 1007	ELECT 47U M 6.3V
C8603	403 139 1007	ELECT 47U M 6.3V
C8604	403 001 1906	CERAMIC 0.01U M 16V
C8699	403 068 9402	CERAMIC 100P K 50V (VHR-7500G,7530G,7540G)
CN853	613 077 0905	SOCKET,21P
OR	613 105 6633	SOCKET,21P

LOCATION	PARTS NO.	DESCRIPTION
D8601	407 012 4406	DIODE 1SS133-T-77
OR	407 007 9904	DIODE GMA01-BT
D8602	407 012 4406	DIODE 1SS133-T-77
OR	407 007 9904	DIODE GMA01-BT
D8611	407 012 4406	DIODE 1SS133-T-77
OR	407 007 9904	DIODE GMA01-BT
D8612	407 012 4406	DIODE 1SS133-T-77
OR	407 007 9904	DIODE GMA01-BT
D8621	407 099 5303	ZENER DIODE MTZJ5.6B-T-77 (VHR-7540G ONLY)
D8622	407 099 5303	ZENER DIODE MTZJ5.6B-T-77 (VHR-7540G ONLY)
D8623	407 099 5303	ZENER DIODE MTZJ5.6B-T-77 (VHR-7540G ONLY)
D8624	407 099 5303	ZENER DIODE MTZJ5.6B-T-77 (VHR-7540G ONLY)
IC861	409 003 4501	IC BA7021
OR	409 120 3401	IC LA7221
L8521	613 014 0739	COIL,INDUCTOR 1.0UHM (VHR-7500G,7530G,7540G)
OR	613 014 4256	HF CHOKE 1.0UH K (VHR-7500G,7530G,7540G)
Q8611	405 004 4007	TR 2SA608-E-SPA-AC
OR	405 004 4601	TR 2SA608-F-SPA-AC
OR	405 006 1707	TR 2SA933S-TP-Q
OR	405 006 1806	TR 2SA933S-T93-R
OR	405 093 0508	TR KSA1175-Y
R8501	401 017 1705	CARBON 2.7K JA 1/4W
R8502	401 017 1705	CARBON 2.7K JA 1/4W
R8503	401 012 5609	CARBON 1K JA 1/4W
R8504	401 014 8509	CARBON 1.6K JA 1/4W
R8602	401 020 2805	CARBON 47K JA 1/4W
R8603	401 012 6903	CARBON 10K JA 1/4W
R8604	401 020 2805	CARBON 47K JA 1/4W
R8605	401 022 6702	CARBON 75 JA 1/4W
R8606	401 020 1907	CARBON 4.7K JA 1/4W
R8611	401 012 6903	CARBON 10K JA 1/4W
R8612	401 012 5609	CARBON 1K JA 1/4W
R8613	401 021 2903	CARBON 5.6K JA 1/4W
R8614	401 021 2903	CARBON 5.6K JA 1/4W
R8615	401 016 4707	CARBON 22K JA 1/4W
R8616	401 021 0602	CARBON 56 JA 1/4W
VR861	613 097 0572	VR,ROTARY 100KB
VR863	613 097 0572	VR,ROTARY 100KB

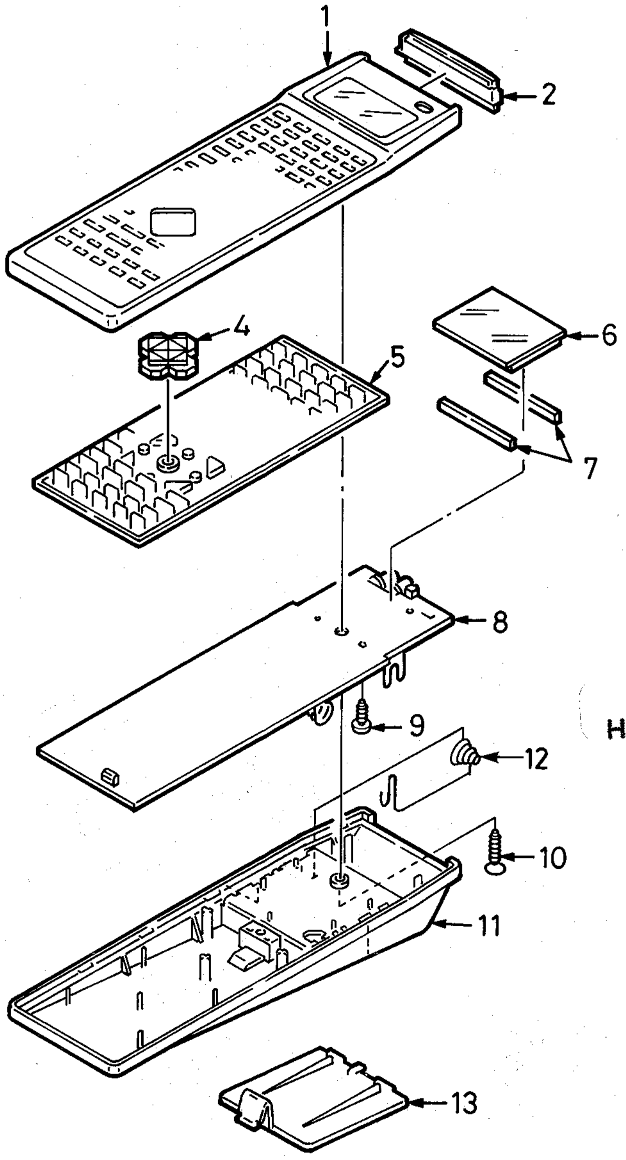
REMOCON

COMPL.NO.	613 112 7883	(VHR-7500G,7530G)
COMPL.NO.	613 111 4210	(VHR-7500EX,8500SP)
1	613 113 2184	ASSY,CABINET,TOP(VHR-7500G,7530G)
OR	613 113 2139	ASSY,CABINET,TOP(VHR-7500EX,8500SP)
2	613 113 1767	BUTTON(VHR-7500G,7530G)
OR	613 113 1736	BUTTON(VHR-7500EX,8500SP)
3	613 087 0087	LCD
4	613 080 9520	CONNECTOR
5	613 080 9728	SPACER
6	411 022 7807	SCR S-TPG PAN 2X6
7	613 080 9681	SIGN WINDOW
8	411 101 7308	SCR S-TPG FLT 2.6X10
9	613 040 1724	BATTERY LID
10	613 040 0727	BOTTOM LID
11	613 110 1128	COMPL,RM-1
12	613 080 9759	TERMINAL,-(INCLUDE RM-1)
13	613 080 9742	TERMINAL,+(INCLUDE RM-1)
14	613 080 9735	TERMINAL

LOCATION	PARTS NO.	DESCRIPTION
COMPL,RM-1		
COMPL.NO.	613 110 1128	(VHR-7500G,EX,7530G,8500SP)
C1	403 068 0409	CERAMIC 0.1U Z 25V
C2	403 049 0800	ELECT 1U M 50V
C3	613 087 2043	CAP,TRIM 20P
C4	403 068 0409	CERAMIC 0.1U Z 25V
C5	403 068 0409	CERAMIC 0.1U Z 25V
C6	403 068 0409	CERAMIC 0.1U Z 25V
C7	403 038 1603	ELECT 100U M 6.3V
IC1	409 218 2309	IC LC5863H-1120
IC2	409 129 3402	IC UPD74HC08G
OR	409 208 1909	IC MLC74HC08AM
OR	409 221 3102	IC MC74HC08AF
LED1	407 040 3709	LED SLR-932A
Q1	405 021 2406	TR 2SD1048-X7-TB
OR	405 021 2505	TR 2SD1048-X8-TB
R1	401 037 5202	MT-GLAZE 100 JA 1/10W
R2	401 015 6405	CARBON 2.2 JA 1/4W
R3	401 037 5202	MT-GLAZE 100 JA 1/10W
R5	401 039 0601	MT-GLAZE 820K JA 1/10W
X1	613 082 8156	OSC,CRYSTAL 38.2293KHZ



LOCATION	PARTS NO.	DESCRIPTION
REMOCON		
COMPL.NO.	613 111 8270	(VHR-7540G ONLY)
1	613 114 5344	ASSY,CABINET,TOP
2	613 100 2142	WINDOW
4	613 101 7207	KNOB
5	613 112 7265	BUTTON
6	613 103 6659	LCD
7	613 103 6567	CONNECTOR
8	613 111 3244	COMPL,RM-1(FVH-P445KV,P445S)
9	411 022 7708	SCR S-TPG PAN 2X5
10	411 022 0709	SCR S-TPG FLT 2X6
11	613 102 1846	CABINET,BOTTOM
12	613 103 6611	TERMINAL,BATTERY
13	613 099 8521	LID,BATTERY



LOCATION	PARTS NO.	DESCRIPTION
COMPL,RM-1		
COMPL.NO.	613 111 3244	(VHR-7540G ONLY)
	613 103 6574	TERMINAL,BATTERY,+
	613 103 6581	TERMINAL,BATTERY,-
C1	403 068 0409	CERAMIC 0.1U Z 25V
C2	403 050 0509	ELECT 2.2U M 50V
C3	613 087 2043	CAP,TRIM 20P
C4	403 068 0409	CERAMIC 0.1U Z 25V
C5	403 068 0409	CERAMIC 0.1U Z 25V
C6	403 068 0409	CERAMIC 0.1U Z 25V
C7	403 038 9708	ELECT 330U M 6.3V
C8	403 018 8905	CERAMIC 220P K 50V
C9	403 018 8905	CERAMIC 220P K 50V
IC1	409 219 0403	IC LC5866H-1132
IC2	409 118 4502	IC MC74HC00F
J2	401 035 4108	MT-GLAZE 0.000 ZA 1/8W
J3	401 035 4108	MT-GLAZE 0.000 ZA 1/8W
J4	401 035 4108	MT-GLAZE 0.000 ZA 1/8W
J6	401 035 4108	MT-GLAZE 0.000 ZA 1/8W
J7	401 035 4108	MT-GLAZE 0.000 ZA 1/8W
LED1	407 113 4206	LED SLR-932A-7
Q2	405 047 5405	TR 2SD1619-T
R1	401 038 0602	MT-GLAZE 220 JA 1/10W
R3	401 036 0307	MT-GLAZE 2.2 JA 1/8W
R6	401 037 5806	MT-GLAZE 1M JA 1/10W
R7	401 037 5202	MT-GLAZE 100 JA 1/10W
R9	401 039 0601	MT-GLAZE 820K JA 1/10W
X1	613 082 8156	OSC,CRYSTAL 38.2293KHZ
X2	613 087 8892	RESONATOR,CERAMIC 800KHZ

1 / PLVHR-7500G
HL06F201 / SERVICE

SANYO

SANYO Electric Co., Ltd.
Osaka, Japan

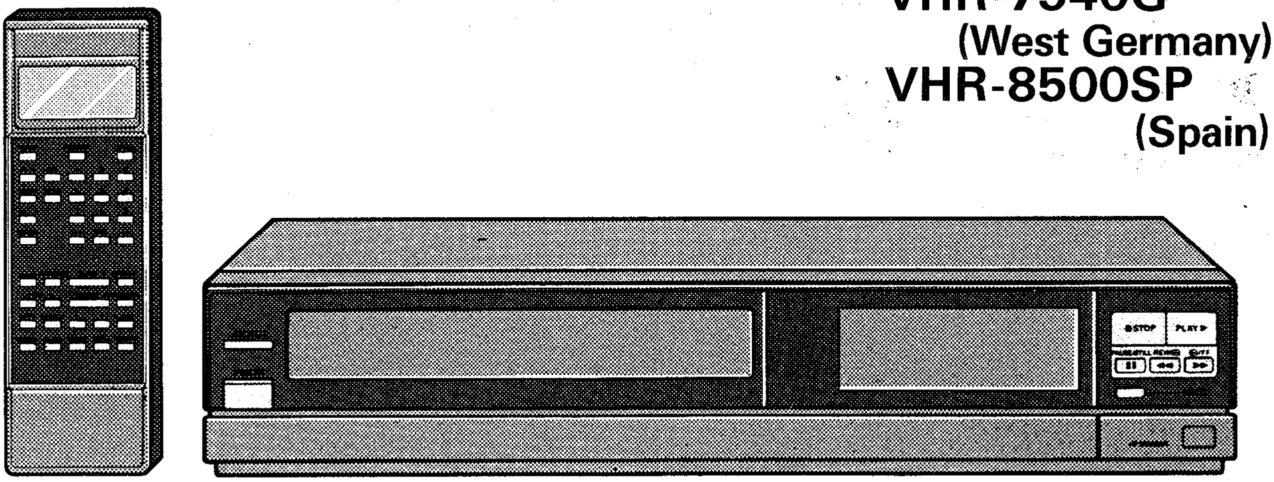
May./'90/3200 NS Printed in Japan

SANYO

Service Manual

Video Cassette
Recorder

VHR-7500 series
VHR-7530G
(Switzerland etc.)
VHR-7540G
(West Germany)
VHR-8500SP
(Spain)


VHR-7500G

VHS PAL HQ

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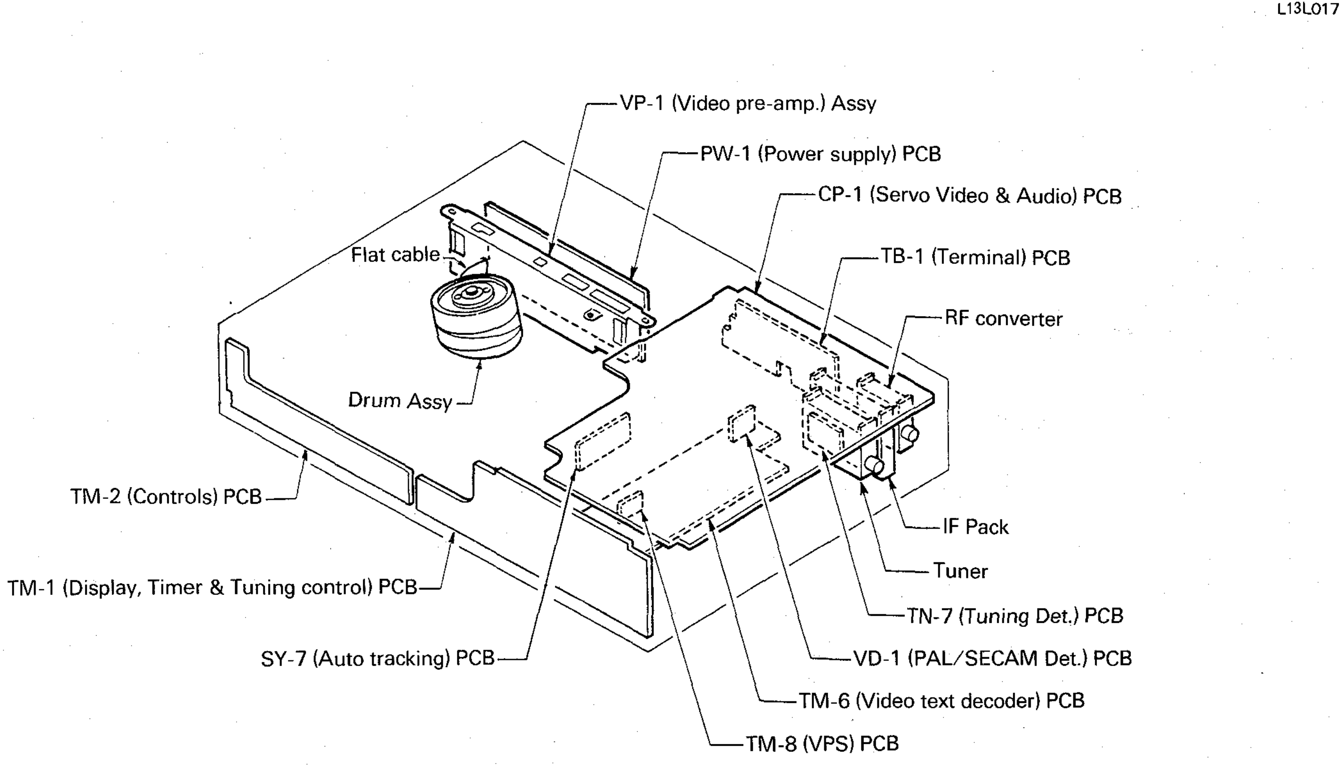
RP4/G, G2, EX, SP, A, SA, ME, HD
RP4V/G

REFERENCE No. WM-530660

1. CIRCUIT BOARD LOCATIONS

1-1. MAIN BOARDS


L13L017
VP-1 (Video pre-amp.) Assy
PW-1 (Power supply) PCB
CP-1 (Servo Video & Audio) PCB
TB-1 (Terminal) PCB
RF converter
Flat cable
Drum Assy
TM-2 (Controls) PCB
TM-1 (Display, Timer & Tuning control) PCB
SY-7 (Auto tracking) PCB
IF Pack
Tuner
TN-7 (Tuning Det.) PCB
VD-1 (PAL/SECAM Det.) PCB
TM-6 (Video text decoder) PCB
TM-8 (VPS) PCB

Note:
* TM-6 (Video text decoder) PCB is installed on VHR-7540G only.
* TM-8 (VPS) PCB is installed on VHR-7500G, 7530G, 7540G.
* VD-1 (PAL/SECAM Det.) PCB is not installed on VHR-7500, 7500SA, 7500HD, 8500SP.

Fig. 1-1

1-2. LOCATION FOR TAPE PATH ADJUSTMENT

NOTE: Test point TP182 and TP183 for tape path adjustment is shown in figure below.
For adjustment, refer to the separate volume "Mechanism Service Technical Information".

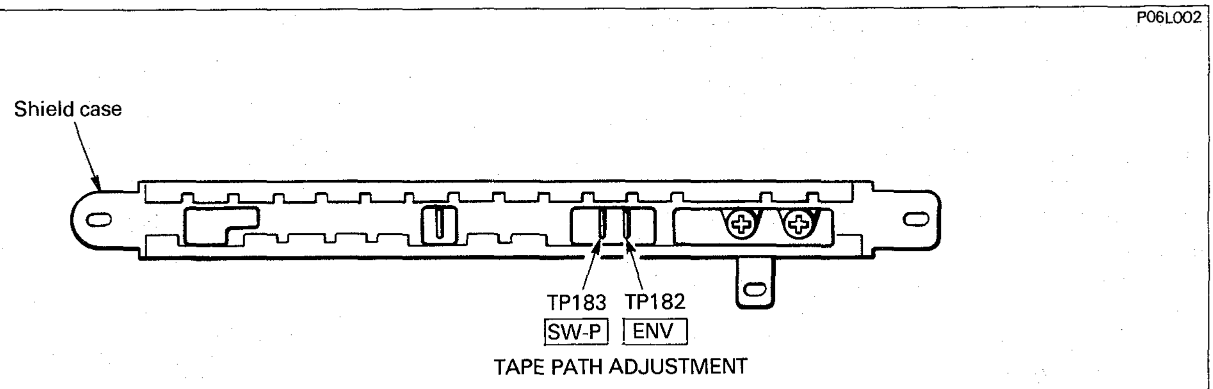

P06L002
Shield case
TP183
TP182
SW-P
ENV
TAPE PATH ADJUSTMENT

Fig. 1-2 Pre-amp Unit

2. ELECTRICAL ADJUSTMENT

2-1. PREPARATION

2-1-1. EQUIPMENT

- Colour TV monitor
- PAL Colour-bar generator (with RF and LINE OUTPUT)
- Audio signal generator
- Oscilloscope (dual trace; frequency response: 10MHz or more; probe: 10:1)
- Frequency counter (countable to 10MHz or higher)
- Digital voltmeter
- AC voltmeter
- In/output probes
- Alignment cassette (VHJ-0008) PAL Colour bar 1KHz
- Alignment cassette (VHJ-0009) Monoscope 6KHz
- Alignment cassette (VHJ-0051) Check for D.O.C.
- Alignment cassette (VHJ-0023) PAL Monoscope 6KHz, PAL Colour-bar 1KHz, SECAM Colour-bar 1KHz, PAL RF Sweep MESECAM Colour-bar 1KHz, NTSC Colour-bar 1KHz.
- Relay jig (VHJ-0066) 7-wire cable for Pre-amp unit
  Connect the Flat cable end from the Drum assembly to the Pre-amp unit using the Relay jig to provide simple repairing and adjustment of the Pre-amp unit, as shown in Fig. 2-1-1. Further, when adjusting the Pre-amp unit, be sure to make contact an end of Shield case with Bracket of the Pre-amp unit to maintain the shield effect.
- Extension relay jig (VHJ-0079) for CP-1 PCB
  Connect between the CP-1 and TM-1 PCB using the Extension relay jig to provide simple repairing and adjustment of the CP-1 PCB, as shown in Fig. 2-1-2. Correctly, connect the Connector from CN304 on the CP-1 PCB to CN005 of the Relay jig, and that from CN001 of the Relay jig to CN711 of the TM-1 PCB. The connector from CN002 of the Relay jig is not required connect.

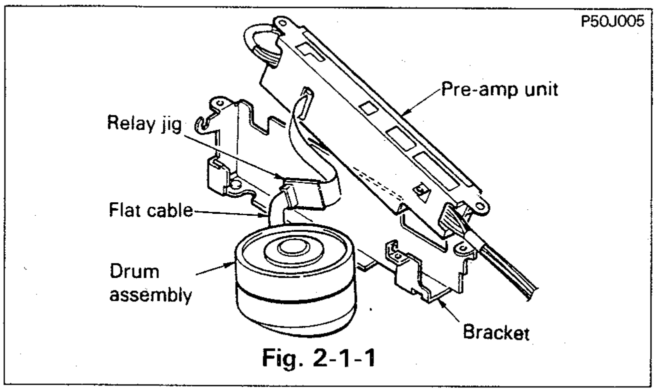

P50J005
Pre-amp unit
Relay jig
Flat cable
Drum assembly
Bracket

Fig. 2-1-1

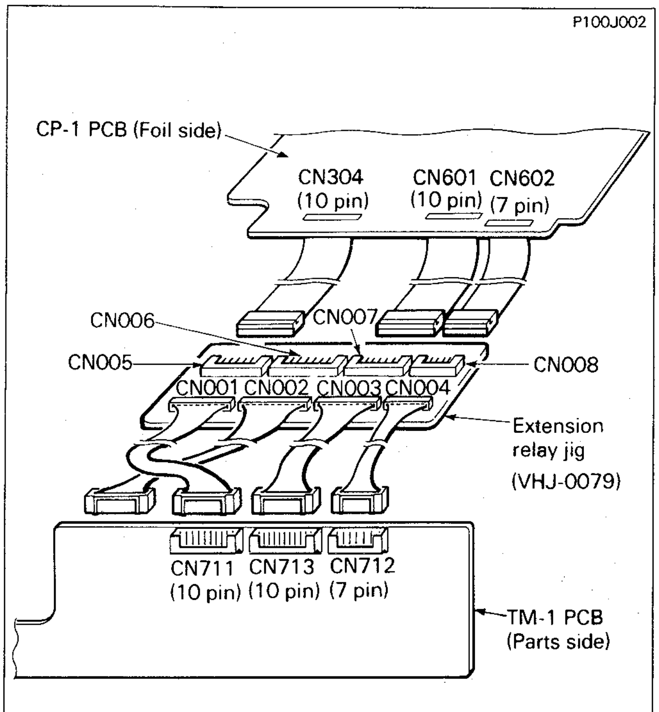

P100J002
CP-1 PCB (Foil side)
CN304 (10 pin)
CN601 (10 pin)
CN602 (7 pin)
CN006
CN007
CN005
CN008
CN001 CN002 CN003 CN004
Extension relay jig (VHJ-0079)
CN711 (10 pin)
CN713 (10 pin)
CN712 (7 pin)
TM-1 PCB (Parts side)

Fig. 2-1-2

2-1-2. SET-UP

Because the RF input signal is used for circuit adjustments, connect the colour-bar generator to the ANT IN terminal of the VCR. The RF input signal is processed by the tuner and IF circuit. It is important that the video output signal of the IF circuit satisfies the items shown in Fig. 2-1-3. Connect the oscilloscope to the VIDEO OUTPUT terminal of the video circuit and terminal with a 75Ω load, and then check the video output signal.

- The amplitude of the sync signal should be approximately 0.3 Vp-p.
- The amplitude of the video signal should be approximately 0.7 Vp-p.
- While observing the oscilloscope or TV screen, make fine-tuning adjustments so that the colour burst amplitude is approximately 0.3 Vp-p.
- Check to be sure that there is no spike noise in the sync part of the horizontal sync signal.

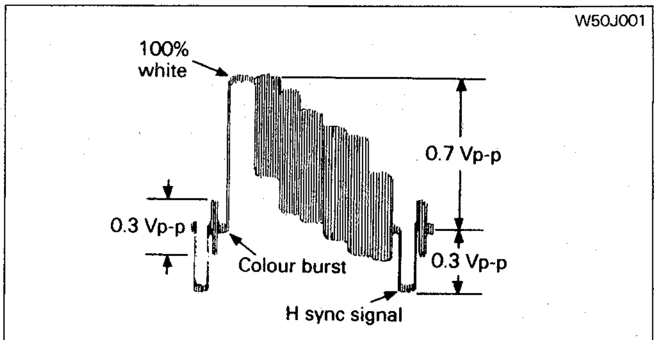


Fig. 2-1-3

2-2. SERVO CIRCUIT ADJUSTMENT ..... CP-1 PCB

NOTE (1) : These adjustments should be carried out upon completion of the transport adjustments.

(2) : If the tape transport adjustments are carried out after these adjustments, follow the procedures again in SWITCHING POSITIONS.

(3) : When adjustment No.4 and No. 5 below, set the SP/LP select switch to the LP position for the model that installed with TAPE SPEED SELECTOR.

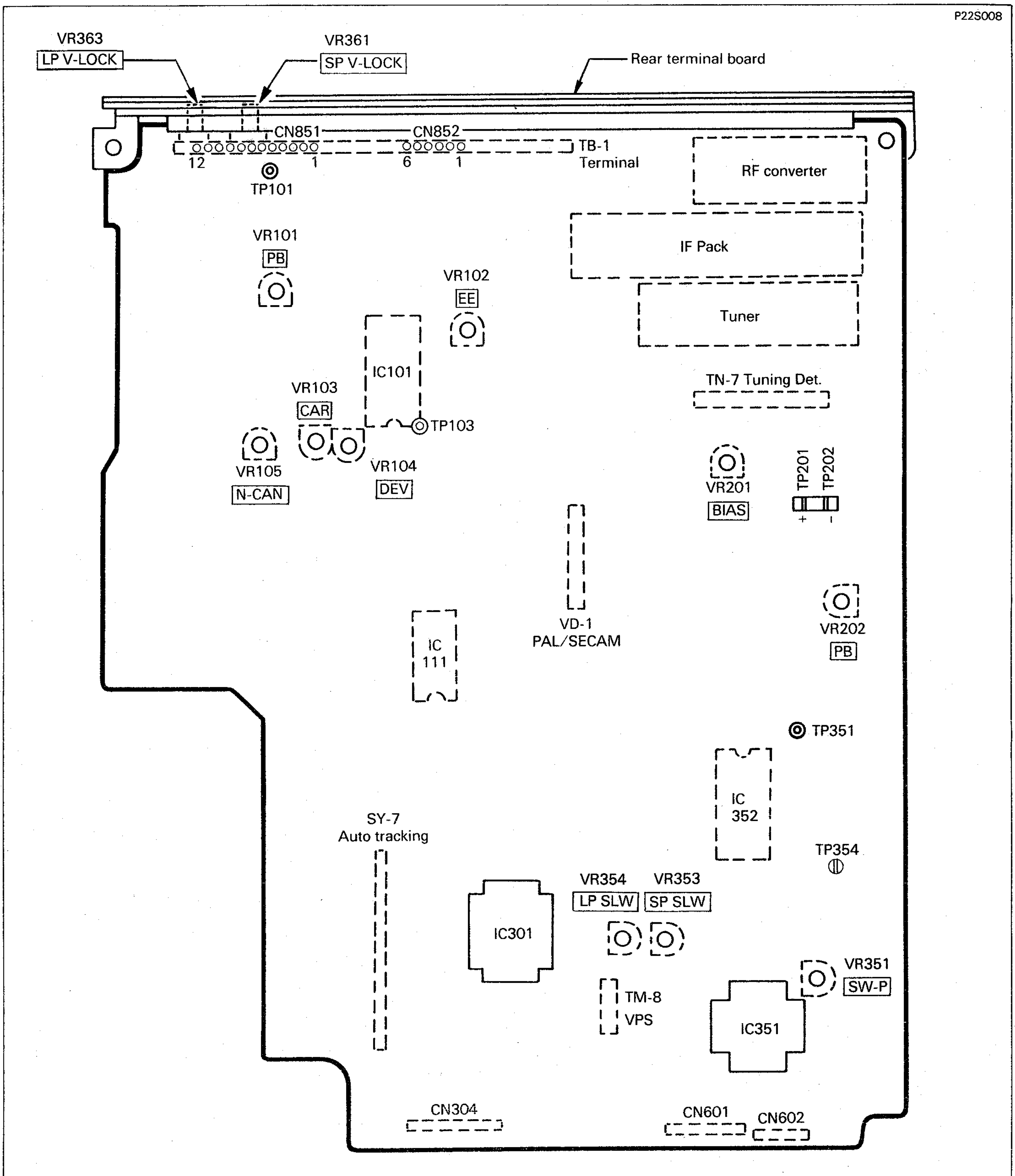
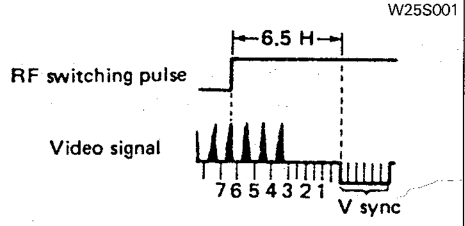
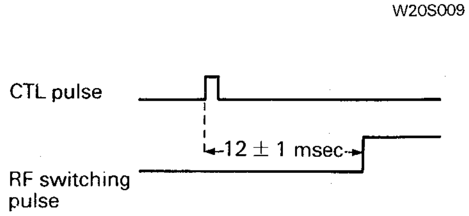
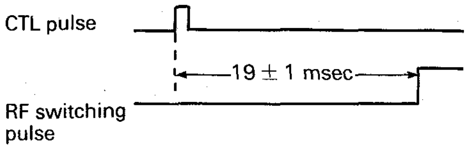

P22S008
VR363
LP V-LOCK
VR361
SP V-LOCK
Rear terminal board
CN851
CN852
12
1
6
1
TB-1
Terminal
TP101
RF converter
IF Pack
Tuner
VR101
PB
VR102
EE
IC101
VR103
CAR
TP103
VR105
N-CAN
VR104
DEV
TN-7 Tuning Det.
VR201
BIAS
TP201
TP202
+
-
VD-1
PAL/SECAM
IC
111
VR202
PB
TP351
IC
352
SY-7
Auto tracking
TP354
VR354
LP SLW
VR353
SP SLW
IC301
VR351
SW-P
TM-8
VPS
IC351
CN304
CN601
CN602

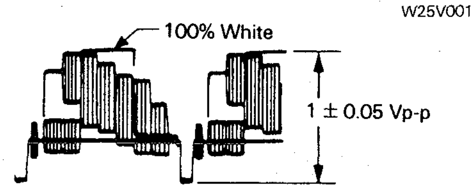
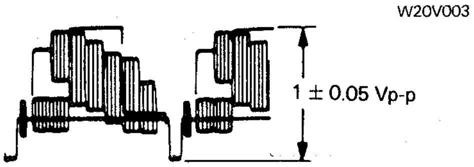
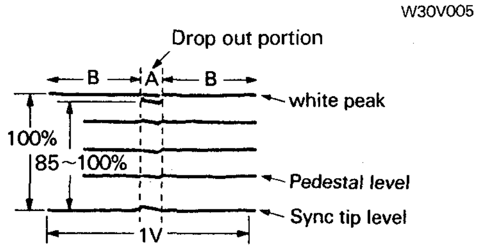
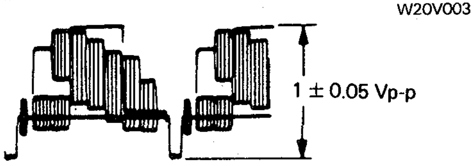
Fig. 2-2-1 CP-1 PCB (Foil side view)

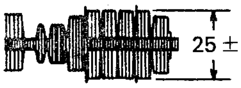
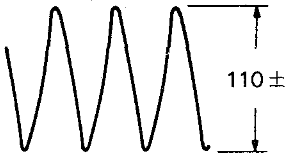
No.	Item	Input	Mode	Point	Location	Remark
1	SWITCHING POSITION	Alignment cassette (VHJ-0009 or VHJ-0023)	PLAY (SP mode)	VIDEO OUTPUT TP101 RF SW pulse TP351	VR351	 W25S001 6.5 H RF switching pulse Video signal 7 6 5 4 3 2 1 V sync 1. Press the tracking control (+) (–) buttons simultaneously to the center position (on the display "T —:— "). 2. Adjust VR351 so that the phase of the leading edge of the vertical sync signal is delayed 6.5 ± 0.5 H from the rise of the RF switching pulse waveform.
2	STILL V-LOCK for SP MODE	Colour bar from Colour bar generator	REC ↓ PLAY ↓ STILL (SP mode)	TV screen	VR361 Rear panel	1. Put the VCR in the REC (SP) mode and record at the middle of the cassette tape. 2. Playback the recorded part, and put the VCR in the STILL (SP) mode. 3. Adjust VR361 so that the V jitter (very fine movement of the vertical sync) is minimized.
3	SLOW TRACKING for SP MODE	Colour bar from Colour bar generator	REC ↓ PLAY ↓ SLOW (SP mode)	TP351 RF SW Pulse TP354 CTL Pulse	VR353	 1. Playback the recorded part, and VCR in the SLOW (SP) mode by remote control unit. 2. Press the tracking control (+) (–) buttons simultaneously to the center position (on the display "T —:— "). 3. Adjust VR353 so that there is a trigger of the peak level of the positive pulse reading edge of the CTL pulse and the time from this point to the leading edge of the RF switching pulse is 12 ± 1 msec. 4. Confirm that the noise at the "+" and "–" terminals for tracking adjustment is same at the upper and lower edges of the screen. If not, readjust VR353.
4	STILL V-LOCK for LP MODE	Colour bar from Colour bar generator	REC ↓ PLAY ↓ STILL (LP mode)	TV screen	VR363 Rear panel	1. Put the VCR in the REC (LP) mode and record at the middle of the cassette tape. 2. Playback the recorded part, and put the VCR in the STILL (LP) mode. 3. Adjust VR363 so that the V jitter (very fine movement of the vertical sync) is minimized.

No.	Item	Input	Mode	Point	Location	Remark
5	SLOW TRACKING for LP MODE	Colour bar from Colour bar generator	REC ↓ PLAY ↓ SLOW (LP mode)	TP351 RF SW Pulse TP354 CTL Pulse	VR354	W20S010  1. Playback the recorded part, and VCR in the SLOW (LP) mode by remote control unit. 2. Press the tracking control (+) (–) buttons simultaneously to the center position (on the display "T —:— "). 3. Adjust VR354 so that there is a trigger of the peak level of the positive pulse reading edge of the CTL pulse and the time from this point to the leading edge of the RF switching pulse is 19 ± 1 msec. 4. Confirm that the noise at the "+" and "–" terminals for tracking adjustment is same at the upper and lower edges of the screen. If not, readjust VR354.

2-3. VIDEO CIRCUIT ADJUSTMENT ... CP-1 PCB and VP-1 Pre-amp Unit

NOTE (1) : When adjustment No. 1, No. 2 and No. 5 below, terminate VIDEO OUTPUT TP101 at 75 ohms.
(2) : Adjustment No. 3 below, should be performed after stabilizing the circuit operation. (At least 5 minutes after VCR power on.)
(3) : 'No-signal REC mode' is not to supply any signal to VIDEO INPUT terminal.
(4) : Use the Relay jig mentiond in the 2-1. PREPARATION to provide easy adjustment of the Pre-amp unit.

No.	Item	Input	Mode	Point	Location	Remark
1	E-E LEVEL	Colour bar (100% white level) from Colour bar generator	E-E	VIDEO OUTPUT TP101 (CP-1 PCB)	VR102	 1. Adjust VR102 so that the level is 1.00 ± 0.05 Vp-p.
2	PB-Y LEVEL	Alignment cassette (VHJ-0008 or VHJ-0023)	PLAY	VIDEO OUTPUT TP101 (CP-1 PCB)	VR101	 1. Adjust VR101 so that the level is 1.00 ± 0.05 Vp-p.
3	N-CAN LEVEL	Alignment cassette (VHJ-0051)	PLAY	VIDEO OUTPUT TP101 (CP-1 PCB)	VR105	 W30V005 Drop out portion B A B white peak 100% 85~100% Pedestal level Sync tip level 1V 1. Set the horizontal scale (TIME/DIV) of the oscilloscope to 1 msec./div.. 2. Adjust VR105 so that the white peak level at drop out portion "A" becomes 85 ~ 100% for the white peak level of no drop out portion "B".
4	CARRIER SET	No-signal	REC	TP103 (CP-1 PCB)	VR103	1. Set the channel selector buttons to the AV position and put the VCR in the no-signal REC mode. 2. Adjust VR103 so that the frequency is 3.80 ± 0.05 MHz.
5	DEVIATION	Colour bar (100% white level) from Colour bar generator	REC (Adjust-ment) ↓ PLAY (Check)	VIDEO OUTPUT TP101 (CP-1 PCB)	VR104	 1. Insert the blank tape to the VCR and record colour bar signal. 2. Playback the recorded part, and check that the level is 1.00 ± 0.05 Vp-p. 3. Repeat adjust VR104 before the record, and the playback it, if not satisfactory.

No.	Item	Input	Mode	Point	Location	Remark
6	C REC CURRENT	*Colour bar from Colour bar generator*	REC	TP181 (HOT) shield case (GND) (Pre-amp unit)	VR181	W15V006  1. Set the SP/LP select switch to the LP position. 2. Rotate VR182 so that the luminance level is minimize. 3. Adjust VR181 so that the level is 25 ± 2 mVp-p.
7	Y REC CURRENT	No-signal	REC	TP181 (HOT) shield case (GND) (Pre-amp unit)	VR182	W20V007  1. Set the SP/LP select switch to the LP position. 2. Set the channel selector buttons to AV position and put the VCR in the no-signal REC mode. 3. Adjust VR182 so that the level is 110 ± 5 mVp-p.

P06V002

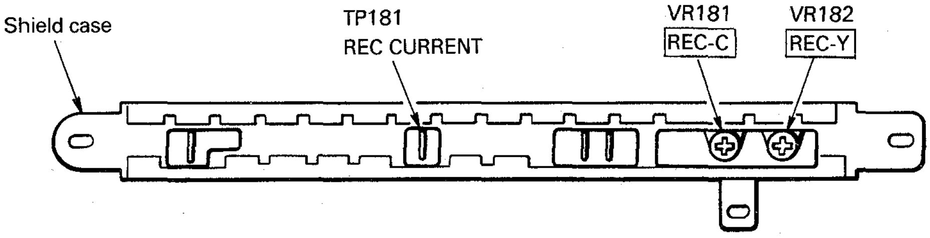


Fig. 2-3-1 Pre-amp Unit

2-4. AUDIO CIRCUIT ADJUSTMENT ... CP-1 PCB

NOTE (1): 'No-signal record mode' is not to supply any signal to AUDIO INPUT terminal.
NOTE (2): Item No. 2 apply to the model that equipped with 21 pin SCART on the rear terminal board.
NOTE (3): Item No. 3 apply to the model that equipped with RCA pin jack on the rear terminal board.

No.	Item	Input	Mode	Point	Location	Remark
1	BIAS LEVEL	No-signal	REC	TP201 TP202 (GND)	VR201	1. Set the channel selector buttons to the AV position and put the VCR in the no-signal REC mode. 2. Adjust VR201 so that the level is 20 mVrms.
2	REC/PB OUTPUT LEVEL	Audio signal (1 KHz, -3.8 dBm) from Audio signal generator	REC ↓ PLAY	AUDIO OUTPUT CN852 pin 5	VR202	1. Adjust VR202 so that the recorded 1 KHz output level becomes -3.8 dBm in the PLAY mode.
3	REC/PB OUTPUT LEVEL	Audio signal (1 KHz, -8 dBm) from Audio signal generator	REC ↓ PLAY	AUDIO OUTPUT terminal	VR202	1. Adjust VR202 so that the recorded 1 KHz output level becomes -8 dBm in the PLAY mode.

2-5. TUNER IF CIRCUIT ADJUSTMENT ... IF Pack

NOTE: When performing the adjustment for the type B model, be sure to remove the rear terminal board fro CP-1 PCB (see Fig. 2-2-1 on page 3).

No.	Item	Input	Mode	Point	Location	Remark
1	RF AGC	TV broadcast	E-E	TV screen	VR611	1. Turn VR611 in the direction which causes snow to appear, then in the opposite direction until the snow just disappears.

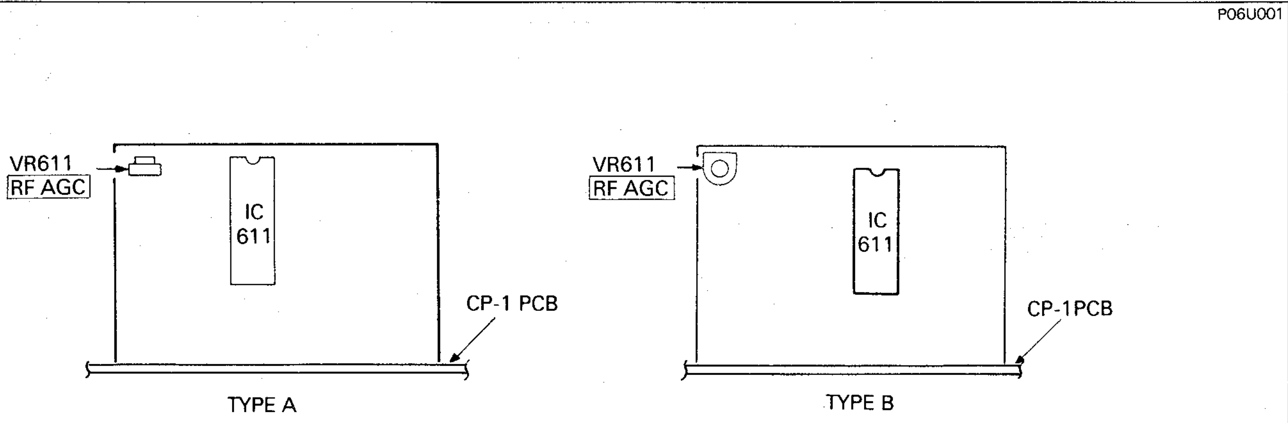


Fig. 2-5-1 IF Pack (Parts side view)

2-6. VIDEO TEXT DECODER CIRCUIT ADJUSTMENT ... TM-6 PCB

No.	Item	Input	Mode	Point	Location	Remark
1	DECODER VXO	NONE	E-E	TP761 TP762 (GND)	CT761	1. Set the vartical scale (VOLTAGE/DIV.) of the oscilloscope to 10 mV/DIV.. 2. Connect the frequency counter to TP761 and TP762 through a pre-amp of the above oscilloscope. 3. Adjust CT761 so that the frequency is 4433610 ± 10 Hz.

P08X001

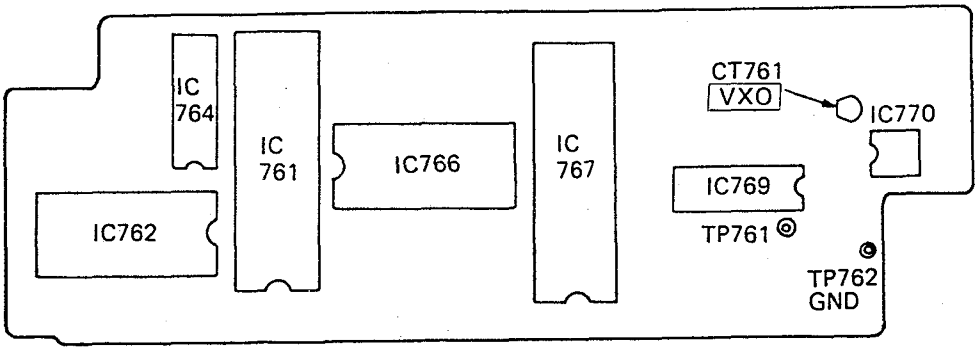

IC 764
IC 761
IC766
IC 767
CT761
VXO
IC770
IC769
IC762
TP761
TP762
GND

Fig. 2-6-1 TM-6 PCB (Parts side view)

SAN

1 / SMVHR-7500G / / 0850
HL06F202 / SERVICE MANUAL

June/'90/4400 HA Printed in Japan

SANYO Electric Co., Ltd.
Osaka, Japan

BLOCK DIAGRAMS, CIRCUIT DIAGRAMS & PRINTED CIRCUIT BOARD

VHR-7500G (West Germany)
VHR-7530G (West Germany)
VHR-7540G (West Germany)
VHR-7500EX (General Europe)
VHR-8500SP (Spain)

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RP4/G, G2, EX, SP, RP4V/G 06H

REFERENCE NO. WM-530661

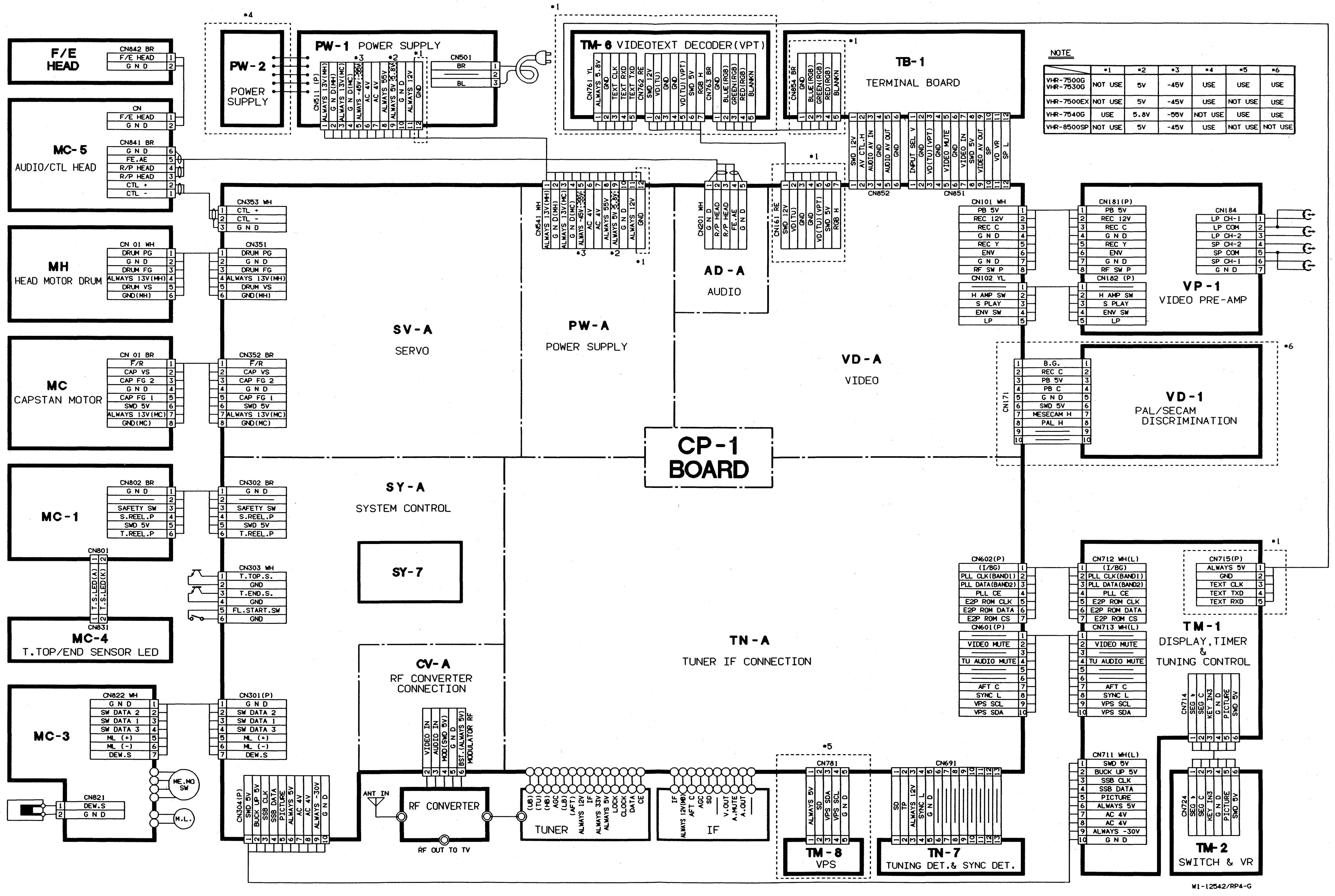
NOTES:

1. All resistance values in "OHMS" unless otherwise noted. (K = 1,000 M = 1,000,000)
2. All capacitance values in "μfd" unless otherwise noted.
   p = pico farad
3. All inductance values in "mH" unless otherwise noted. μ = micro henry

PRODUCT SAFETY NOTICE

THE COMPONENTS DESIGNATED BY A SYMBOL (⚠) IN THIS SCHEMATIC DIAGRAM DESIGNATES COMPONENTS WHOSE VALUE ARE OF SPECIAL SIGNIFICANCE TO PRODUCT SAFETY. SHOULD ANY COMPONENT DESIGNATED BY A SIMBOL NEED TO BE REPLACED, USE ONLY THE PART DESIGNATED IN THE PARTS LIST. DO NOT DEVIATE FROM THE RESISTANCE, WATTAGE AND VOLTAGE RATINGS SHOWN.

OVERALL WIRING DIAGRAM


F/E HEAD
CN842 BR
F/E HEAD
G N D
MC-5
AUDIO/CTL HEAD
CN
F/E HEAD
G N D
CN841 BR
G N D
FE.AE
R/P HEAD
R/P HEAD
CTL +
CTL -
MH
HEAD MOTOR DRUM
CN 01 WH
DRUM PG
G N D
DRUM FG
ALWAYS 13V(MH)
DRUM VS
GND(MH)
MC
CAPSTAN MOTOR
CN 01 BR
F/R
CAP VS
CAP FG 2
G N D
CAP FG 1
SWD 5V
ALWAYS 13V(MC)
GND(MC)
MC-1
CN802 BR
G N D
SAFETY SW
S.REEL.P
SWD 5V
T.REEL.P
CN801
T.S.LED(A)
T.S.LED(K)
CN831
MC-4
T.TOP/END SENSOR LED
MC-3
CN822 WH
G N D
SW DATA 2
SW DATA 1
SW DATA 3
ML (+)
ML (-)
DEW.S
CN821
DEW.S
G N D
ME.MO SW
M.L.
PW-2
POWER SUPPLY
PW-1 POWER SUPPLY
CN511 (P)
ALWAYS 13V(MH)
G N D(MH)
ALWAYS 13V(MC)
G N D(MC)
ALWAYS -45V(-35V)
AC 4V
AC 4V
ALWAYS 55V
ALWAYS 5V(5.8V)
G N D
ALWAYS 12V
GND
CN501
BR
BL
TM-6 VIDEOTEXT DECODER(VPT)
CN761 YL
ALWAYS 5.8V
GND
TEXT CLK
TEXT RXD
TEXT TXD
CN762 RE
SWD 12V
VD(TU)
GND
GND
VD(TU)(VPT)
SWD 5V
RGB H
CN763 BR
GND
BLUE(RGB)
GREEN(RGB)
RED(RGB)
BLANKN
CN854 BR
GND
BLUE(RGB)
GREEN(RGB)
RED(RGB)
BLANKN
TB-1
TERMINAL BOARD
SWD 12V
AV CTL.H
AUDIO AV IN
GND
AUDIO AV OUT
GND
INPUT SEL V
GND
VD(TU)(VPT)
GND
VIDEO MUTE
GND
VIDEO IN
SWD 5V
VIDEO AV OUT
SP
VD VR
SP L
CN852
CN851
CN353 WH
CTL +
CTL -
G N D
CN351
DRUM PG
G N D
DRUM FG
ALWAYS 13V(MH)
DRUM VS
GND(MH)
CN352 BR
F/R
CAP VS
CAP FG 2
G N D
CAP FG 1
SWD 5V
ALWAYS 13V(MC)
GND(MC)
CN302 BR
G N D
SAFETY SW
S.REEL.P
SWD 5V
T.REEL.P
CN303 WH
T.TOP.S.
GND
T.END.S.
GND
FL.START.SW
GND
CN301(P)
G N D
SW DATA 2
SW DATA 1
SW DATA 3
ML (+)
ML (-)
DEW.S
CN541 WH
ALWAYS 13V(MH)
G N D(MH)
ALWAYS 13V(MC)
G N D(MC)
ALWAYS -45V(-35V)
AC 4V
AC 4V
ALWAYS 55V
ALWAYS 5V(5.8V)
G N D
ALWAYS 12V
GND
CN201 WH
G N D
R/P HEAD
R/P HEAD
FE.AE
G N D
CN161 RE
SWD 12V
VD(TU)
GND
GND
VD(TU)(VPT)
SWD 5V
RGB H
SV-A
SERVO
PW-A
POWER SUPPLY
AD-A
AUDIO
VD-A
VIDEO
CP-1
BOARD
SY-A
SYSTEM CONTROL
SY-7
CV-A
RF CONVERTER CONNECTION
TN-A
TUNER IF CONNECTION
CN101 WH
PB 5V
REC 12V
REC C
G N D
REC Y
ENV
G N D
RF SW P
CN102 YL
H AMP SW
S PLAY
ENV SW
LP
CN181(P)
PB 5V
REC 12V
REC C
G N D
REC Y
ENV
G N D
RF SW P
CN182 (P)
H AMP SW
S PLAY
ENV SW
LP
CN184
LP CH-1
LP COM
LP CH-2
SP CH-2
SP COM
SP CH-1
G N D
VP-1
VIDEO PRE-AMP
CN171
B.G.
REC C
PB 5V
PB C
G N D
SWD 5V
MESECAM H
PAL H
VD-1
PAL/SECAM DISCRIMINATION
CN602(P)
(I/BG)
PLL CLK(BAND1)
PLL DATA(BAND2)
PLL CE
E2P ROM CLK
E2P ROM DATA
E2P ROM CS
CN601(P)
VIDEO MUTE
TU AUDIO MUTE
AFT C
SYNC L
VPS SCL
VPS SDA
CN712 WH(L)
(I/BG)
PLL CLK(BAND1)
PLL DATA(BAND2)
PLL CE
E2P ROM CLK
E2P ROM DATA
E2P ROM CS
CN713 WH(L)
VIDEO MUTE
TU AUDIO MUTE
AFT C
SYNC L
VPS SCL
VPS SDA
CN715(P)
ALWAYS 5V
GND
TEXT CLK
TEXT TXD
TEXT RXD
TM-1
DISPLAY,TIMER & TUNING CONTROL
CN714
SEG C
KEY IN3
G N D
PICTURE
SWD 5V
CN711 WH(L)
SWD 5V
BUCK UP 5V
SSB CLK
SSB DATA
PICTURE
ALWAYS 5V
AC 4V
AC 4V
ALWAYS -30V
G N D
CN724
SEG C
KEY IN3
G N D
PICTURE
SWD 5V
TM-2
SWITCH & VR
CN304(P)
SWD 5V
BUCK UP 5V
SSB CLK
SSB DATA
PICTURE
ALWAYS 5V
AC 4V
AC 4V
ALWAYS -30V
G N D
VIDEO IN
AUDIO IN
MOD(SWD 5V)
G N D
BST.(ALWAYS 5V)
MODULATOR RF
ANT IN
RF CONVERTER
RF OUT TO TV
(UB)
(TU)
(HB)
AGC
(LB)
(AFT)
ALWAYS 12V
IF
ALWAYS 33V
ALWAYS 5V
LOCK
CLOCK
DATA
CE
TUNER
IF
ALWAYS 12V(HB)
AFT C
AGC
SD
V.OUT
A.MUTE
A.OUT
IF
CN781
ALWAYS 5V
SD
VPS SDA
VPS SCL
G N D
TM-8
VPS
CN691
SD
TP
ALWAYS 12V
SYNC L
G N D
TN-7
TUNING DET.& SYNC DET.
*1
*2
*3
*4
*5
*6
W1-12542/RP4-G
K
J
I
H
G
F
E
D
C
B
A
1
2
3
4
5
6
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9
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11
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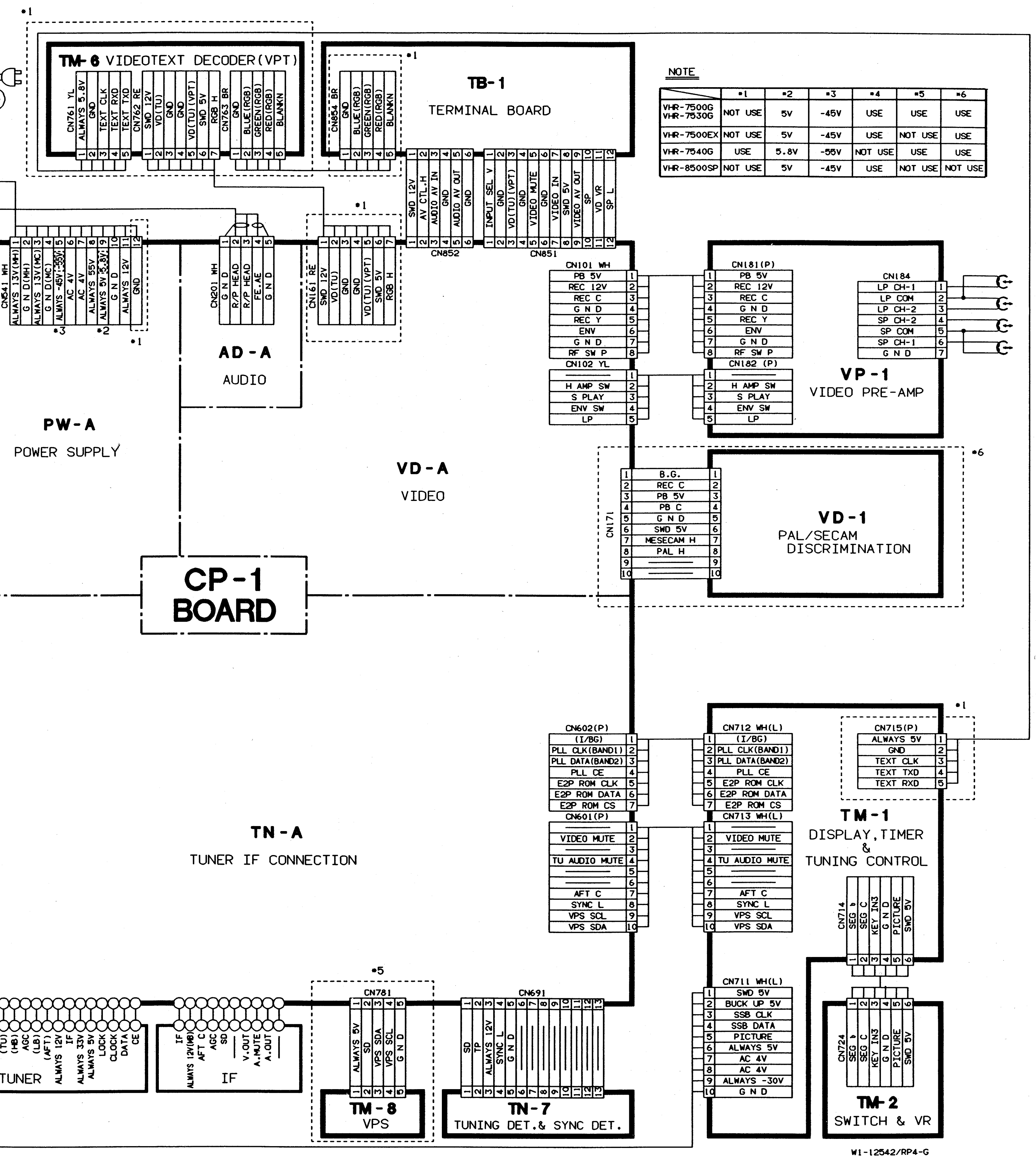
14
15
16

NOTE

	*1	*2	*3	*4	*5	*6
VHR-7500G VHR-7530G	NOT USE	5V	-45V	USE	USE	USE
VHR-7500EX	NOT USE	5V	-45V	USE	NOT USE	USE
VHR-7540G	USE	5.8V	-55V	NOT USE	USE	USE
VHR-8500SP	NOT USE	5V	-45V	USE	NOT USE	NOT USE

L WIRING DIAGRAM

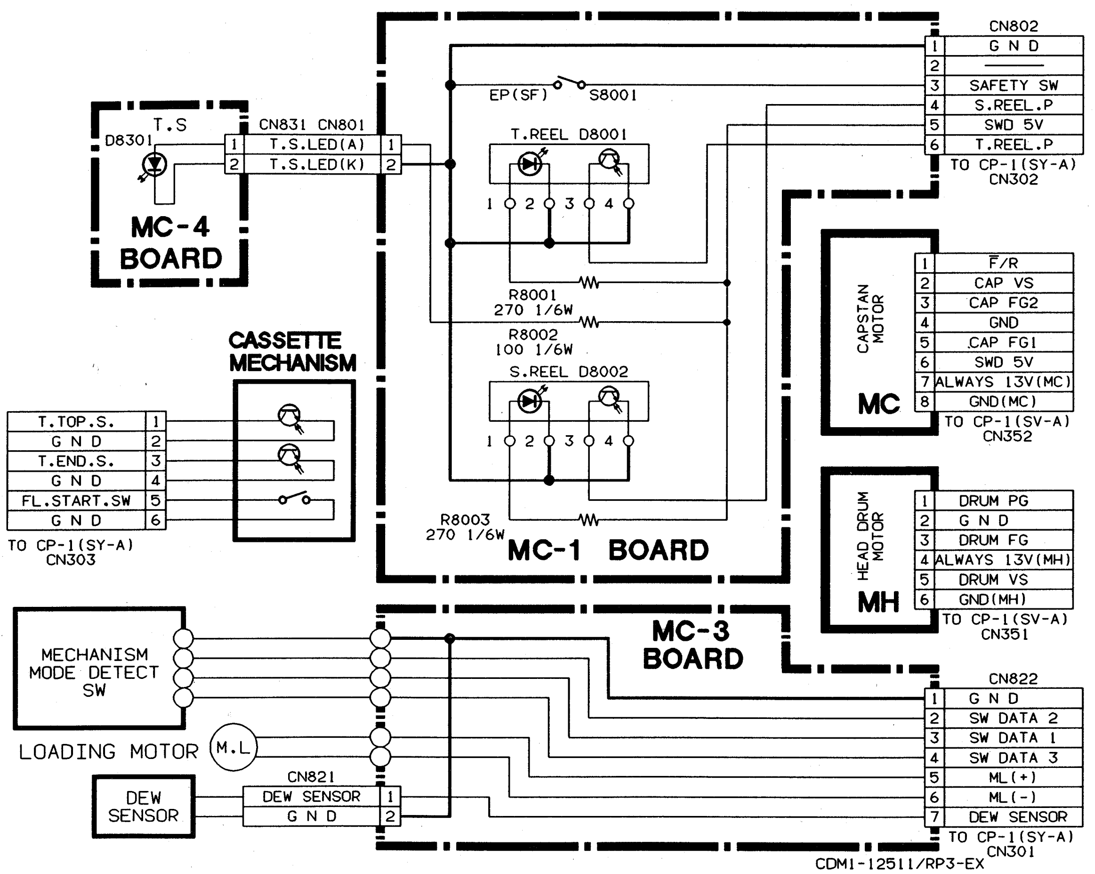


TM-6 VIDEOTEXT DECODER(VPT)
CN761 YL
CN762 RE
CN763 BR
TB-1
TERMINAL BOARD
CN854 BR
CN852
CN851
CN541 WH
CN201 WH
CN161 RE
AD-A
AUDIO
PW-A
POWER SUPPLY
VD-A
VIDEO
CP-1
BOARD
CN101 WH
CN102 YL
CN181(P)
CN182 (P)
CN184
VP-1
VIDEO PRE-AMP
CN171
VD-1
PAL/SECAM
DISCRIMINATION
CN602(P)
CN601(P)
CN712 WH(L)
CN713 WH(L)
CN715(P)
TM-1
DISPLAY, TIMER
&
TUNING CONTROL
TN-A
TUNER IF CONNECTION
CN714
CN711 WH(L)
CN724
TM-2
SWITCH & VR
CN781
TM-8
VPS
CN691
TN-7
TUNING DET.& SYNC DET.
TUNER
IF
W1-12542/RP4-G

NOTE

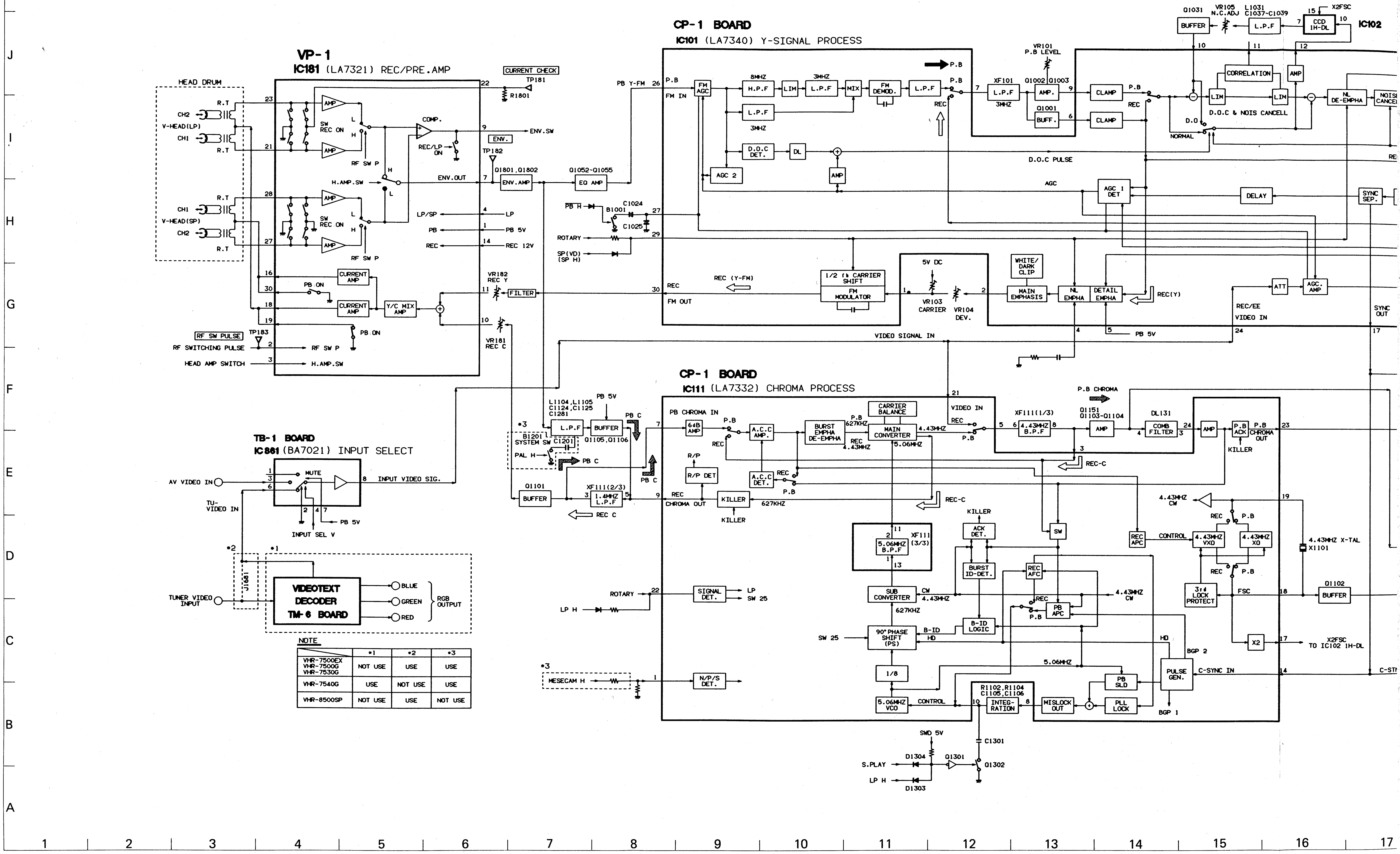
	*1	*2	*3	*4	*5	*6
VHR-7500G VHR-7530G	NOT USE	5V	-45V	USE	USE	USE
VHR-7500EX	NOT USE	5V	-45V	USE	NOT USE	USE
VHR-7540G	USE	5.8V	-55V	NOT USE	USE	USE
VHR-8500SP	NOT USE	5V	-45V	USE	NOT USE	NOT USE

MECHANISM CONNECTION CIRCUIT DIAGRAM



MC-4
BOARD
T.S
D8301
CN831 CN801
T.S.LED(A)
T.S.LED(K)
CASSETTE
MECHANISM
T.TOP.S.
G N D
T.END.S.
G N D
FL.START.SW
G N D
TO CP-1(SY-A)
CN303
EP(SF)
S8001
T.REEL D8001
R8001
270 1/6W
R8002
100 1/6W
S.REEL D8002
R8003
270 1/6W
MC-1 BOARD
CN802
G N D
SAFETY SW
S.REEL.P
SWD 5V
T.REEL.P
TO CP-1(SY-A)
CN302
CAPSTAN
MOTOR
MC
F/R
CAP VS
CAP FG2
GND
CAP FG1
SWD 5V
ALWAYS 13V(MC)
GND(MC)
TO CP-1(SV-A)
CN352
HEAD DRUM
MOTOR
MH
DRUM PG
G N D
DRUM FG
ALWAYS 13V(MH)
DRUM VS
GND(MH)
TO CP-1(SV-A)
CN351
MECHANISM
MODE DETECT
SW
LOADING MOTOR
M.L
MC-3
BOARD
DEW
SENSOR
CN821
DEW SENSOR
G N D
CN822
G N D
SW DATA 2
SW DATA 1
SW DATA 3
ML(+)
ML(-)
DEW SENSOR
TO CP-1(SY-A)
CN301
CDM1-12511/RP3-EX

VIDEO CIRCUIT BASIC BLOCK DIAGRAM


K
J
I
H
G
F
E
D
C
B
A
1
2
3
4
5
6
7
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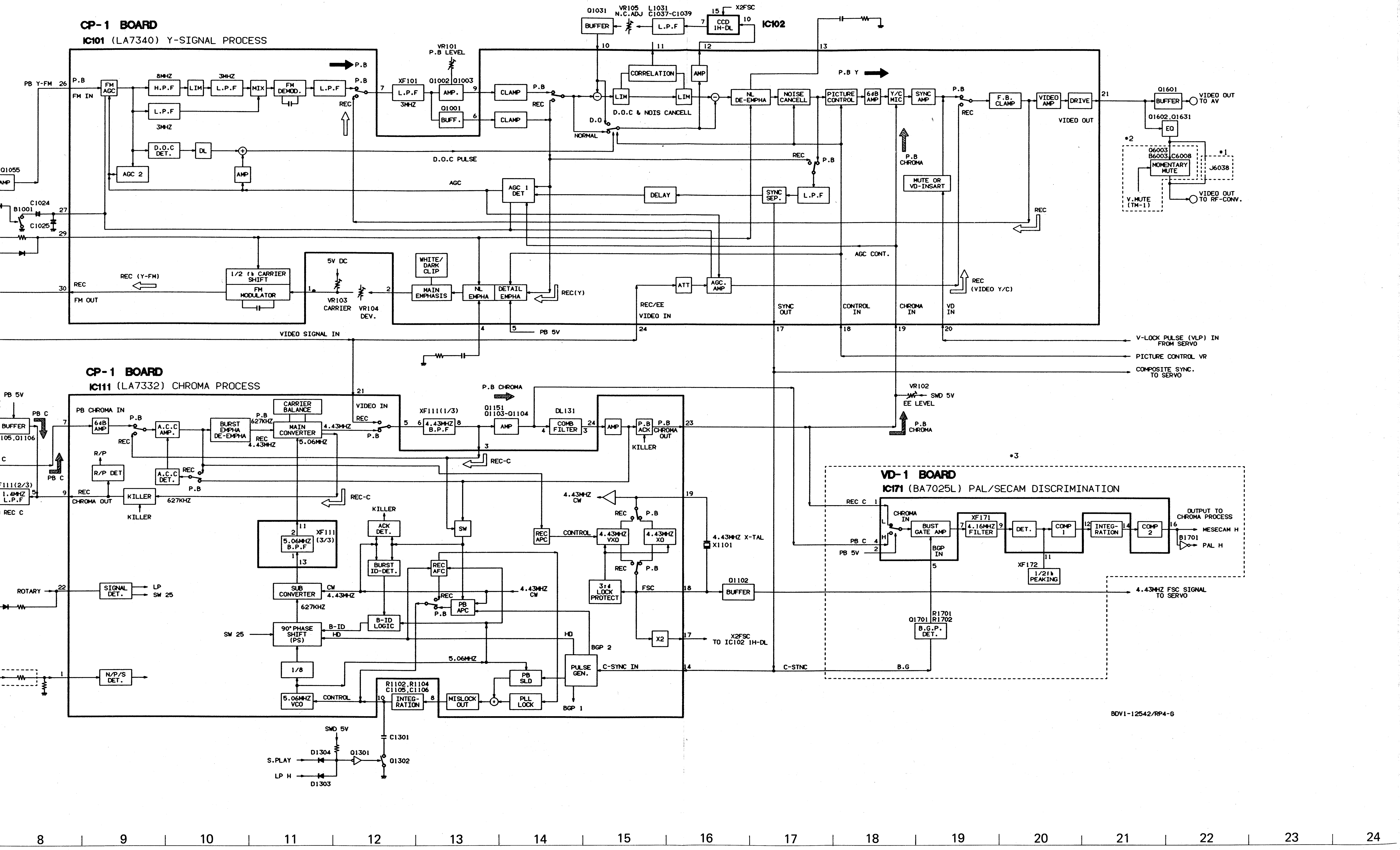
9
10
11
12
13
14
15
16
17
VP-1
IC181 (LA7321) REC/PRE.AMP
HEAD DRUM
R.T
CH2
V-HEAD(LP)
CH1
CH1
V-HEAD(SP)
CH2
AMP
SW
REC ON
COMP.
ENV.SW
REC/LP ON
RF SW P
H.AMP.SW
ENV.OUT
LP/SP
PB
REC
LP
PB 5V
REC 12V
CURRENT AMP
PB ON
Y/C MIX AMP
CURRENT CHECK
TP181
R1801
ENV.
TP182
Q1801,Q1802
ENV.AMP
VR182 REC Y
FILTER
VR181 REC C
RF SW PULSE
TP183
RF SWITCHING PULSE
RF SW P
HEAD AMP SWITCH
H.AMP.SW
Q1052-Q1055
EQ AMP
PB Y-FM
PB H
B1001
C1024
C1025
ROTARY
SP(VD) (SP H)
CP-1 BOARD
IC101 (LA7340) Y-SIGNAL PROCESS
P.B
FM IN
FM AGC
8MHZ H.P.F
LIM
3MHZ L.P.F
MIX
FM DEMOD.
L.P.F
3MHZ
D.O.C DET.
DL
AMP
AGC 2
REC
XF101
L.P.F
3MHZ
Q1002 Q1003
AMP.
Q1001
BUFF.
VR101 P.B LEVEL
CLAMP
D.O.C PULSE
AGC
AGC 1 DET
DELAY
SYNC SEP.
Q1031
BUFFER
VR105 N.C.ADJ
L1031 C1037-C1039
L.P.F
CCD 1H-DL
X2FSC
IC102
CORRELATION
LIM
D.O.C & NOIS CANCELL
NL DE-EMPHA
NOISE CANCEL
D.O
NORMAL
REC (Y-FM)
FM OUT
1/2 fH CARRIER SHIFT
FM MODULATOR
5V DC
VR103 CARRIER
VR104 DEV.
WHITE/DARK CLIP
MAIN EMPHASIS
NL EMPHA
DETAIL EMPHA
REC(Y)
ATT
AGC. AMP
REC/EE VIDEO IN
SYNC OUT
PB 5V
VIDEO SIGNAL IN
CP-1 BOARD
IC111 (LA7332) CHROMA PROCESS
PB CHROMA IN
64B AMP
A.C.C AMP.
BURST EMPHA DE-EMPHA
CARRIER BALANCE
MAIN CONVERTER
627KHZ
4.43MHZ
5.06MHZ
VIDEO IN
XF111(1/3)
4.43MHZ B.P.F
Q1151 Q1103-Q1104
P.B CHROMA
DL131
COMB FILTER
P.B ACK
P.B CHROMA OUT
KILLER
REC-C
R/P
R/P DET
A.C.C DET.
KILLER
CHROMA OUT
XF111 (3/3)
5.06MHZ B.P.F
ACK DET.
SW
BURST ID-DET.
REC AFC
REC APC
CONTROL
4.43MHZ VXO
4.43MHZ XO
4.43MHZ CW
4.43MHZ X-TAL X1101
3rd LOCK PROTECT
FSC
Q1102
BUFFER
X2
X2FSC TO IC102 1H-DL
SUB CONVERTER
CW
PB APC
B-ID LOGIC
90° PHASE SHIFT (PS)
B-ID
HD
SW 25
1/8
5.06MHZ VCO
R1102,R1104 C1105,C1106
INTEG-RATION
MISLOCK OUT
PB SLD
PLL LOCK
PULSE GEN.
BGP 2
BGP 1
C-SYNC IN
C-STN
SIGNAL DET.
ROTARY
LP H
N/P/S DET.
MESECAM H
SWD 5V
C1301
D1304
Q1301
Q1302
S.PLAY
LP H
D1303
L1104,L1105 C1124,C1125 C1281
L.P.F
BUFFER
PB C
Q1105,Q1106
B1201 SYSTEM SW
C1201
PAL H
Q1101
BUFFER
XF111(2/3) 1.4MHZ L.P.F
REC C
TB-1 BOARD
IC861 (BA7021) INPUT SELECT
AV VIDEO IN
TU-VIDEO IN
MUTE
INPUT VIDEO SIG.
PB 5V
INPUT SEL V
TUNER VIDEO INPUT
J1681
VIDEOTEXT DECODER TM-6 BOARD
BLUE
GREEN
RED
RGB OUTPUT
*1
*2
*3

NOTE

	*1	*2	*3
VHR-7500EX VHR-7500G VHR-7530G	NOT USE	USE	USE
VHR-7540G	USE	NOT USE	USE
VHR-8500SP	NOT USE	USE	NOT USE

VIDEO CIRCUIT BASIC BLOCK DIAGRAM


CP-1 BOARD
IC101 (LA7340) Y-SIGNAL PROCESS
PB Y-FM
P.B
FM IN
FM AGC
8MHZ
H.P.F
LIM
3MHZ
L.P.F
MIX
FM DEMOD.
L.P.F
P.B
REC
L.P.F
3MHZ
D.O.C DET.
DL
AGC 2
AMP
Q1055
AMP
B1001
C1024
C1025
REC
FM OUT
REC (Y-FM)
1/2 fh CARRIER SHIFT
FM MODULATOR
5V DC
VR103 CARRIER
VR104 DEV.
WHITE/ DARK CLIP
MAIN EMPHASIS
NL EMPHA
DETAIL EMPHA
REC(Y)
PB 5V
VIDEO SIGNAL IN
VR101 P.B LEVEL
XF101
L.P.F
3MHZ
Q1002 Q1003
AMP.
Q1001
BUFF.
CLAMP
CLAMP
P.B
REC
D.O.C PULSE
AGC
AGC 1 DET
Q1031
BUFFER
VR105 N.C.ADJ
L1031 C1037-C1039
L.P.F
X2FSC
CCD 1H-DL
IC102
CORRELATION
AMP
LIM
LIM
D.O
NORMAL
D.O.C & NOIS CANCELL
DELAY
SYNC SEP.
L.P.F
P.B Y
NL DE-EMPHA
NOISE CANCELL
PICTURE CONTROL
6dB AMP
Y/C MIC
SYNC AMP
P.B
REC
F.B. CLAMP
VIDEO AMP
DRIVE
VIDEO OUT
REC
P.B
P.B CHROMA
MUTE OR VD-INSART
REC
AGC CONT.
ATT
AGC. AMP
REC (VIDEO Y/C)
REC/EE VIDEO IN
SYNC OUT
CONTROL IN
CHROMA IN
VD IN
Q1601
BUFFER
VIDEO OUT TO AV
Q1602,Q1631
EQ
*2
Q6003 B6003,C6008
MOMENTARY MUTE
*1
J6038
V.MUTE (TM-1)
VIDEO OUT TO RF-CONV.
V-LOCK PULSE (VLP) IN FROM SERVO
PICTURE CONTROL VR
COMPOSITE SYNC. TO SERVO
CP-1 BOARD
IC111 (LA7332) CHROMA PROCESS
PB 5V
PB C
BUFFER
Q1105,Q1106
PB CHROMA IN
6dB AMP
P.B
REC
A.C.C AMP.
BURST EMPHA DE-EMPHA
P.B 627KHZ
CARRIER BALANCE
MAIN CONVERTER
4.43MHZ
5.06MHZ
REC 4.43MHZ
R/P
R/P DET
A.C.C DET.
REC
P.B
PB C
XF111(2/3) 1.4MHZ L.P.F
REC C
REC
CHROMA OUT
KILLER
KILLER
627KHZ
REC-C
VIDEO IN
REC
P.B
XF111(1/3)
4.43MHZ B.P.F
Q1151 Q1103-Q1104
AMP
P.B CHROMA
DL131
COMB FILTER
AMP
P.B ACK
P.B CHROMA OUT
KILLER
REC-C
XF111 (3/3)
5.06MHZ B.P.F
KILLER
ACK DET.
SW
BURST ID-DET.
REC AFC
REC APC
CONTROL
4.43MHZ VXO
4.43MHZ XO
4.43MHZ CW
REC
P.B
4.43MHZ X-TAL X1101
ROTARY
SIGNAL DET.
LP
SW 25
SUB CONVERTER
CW 4.43MHZ
627KHZ
REC
P.B
PB APC
4.43MHZ CW
3fH LOCK PROTECT
FSC
Q1102
BUFFER
SW 25
90° PHASE SHIFT (PS)
B-ID
HD
B-ID LOGIC
HD
BGP 2
X2
X2FSC TO IC102 1H-DL
1/8
5.06MHZ
PB SLD
PULSE GEN.
C-SYNC IN
C-STNC
N/P/S DET.
5.06MHZ VCO
CONTROL
R1102,R1104 C1105,C1106
INTEG-RATION
MISLOCK OUT
PLL LOCK
BGP 1
SWD 5V
C1301
D1304
Q1301
Q1302
S.PLAY
LP H
D1303
VR102
SWD 5V
EE LEVEL
P.B CHROMA
*3
VD-1 BOARD
IC171 (BA7025L) PAL/SECAM DISCRIMINATION
REC C
PB C
PB 5V
CHROMA IN
BUST GATE AMP
BGP IN
XF171
4.16MHZ FILTER
DET.
COMP 1
INTEG-RATION
COMP 2
OUTPUT TO CHROMA PROCESS
MESECAM H
B1701
PAL H
XF172
1/2fh PEAKING
4.43MHZ FSC SIGNAL TO SERVO
Q1701
R1701 R1702
B.G.P. DET.
B.G
BDV1-12542/RP4-G
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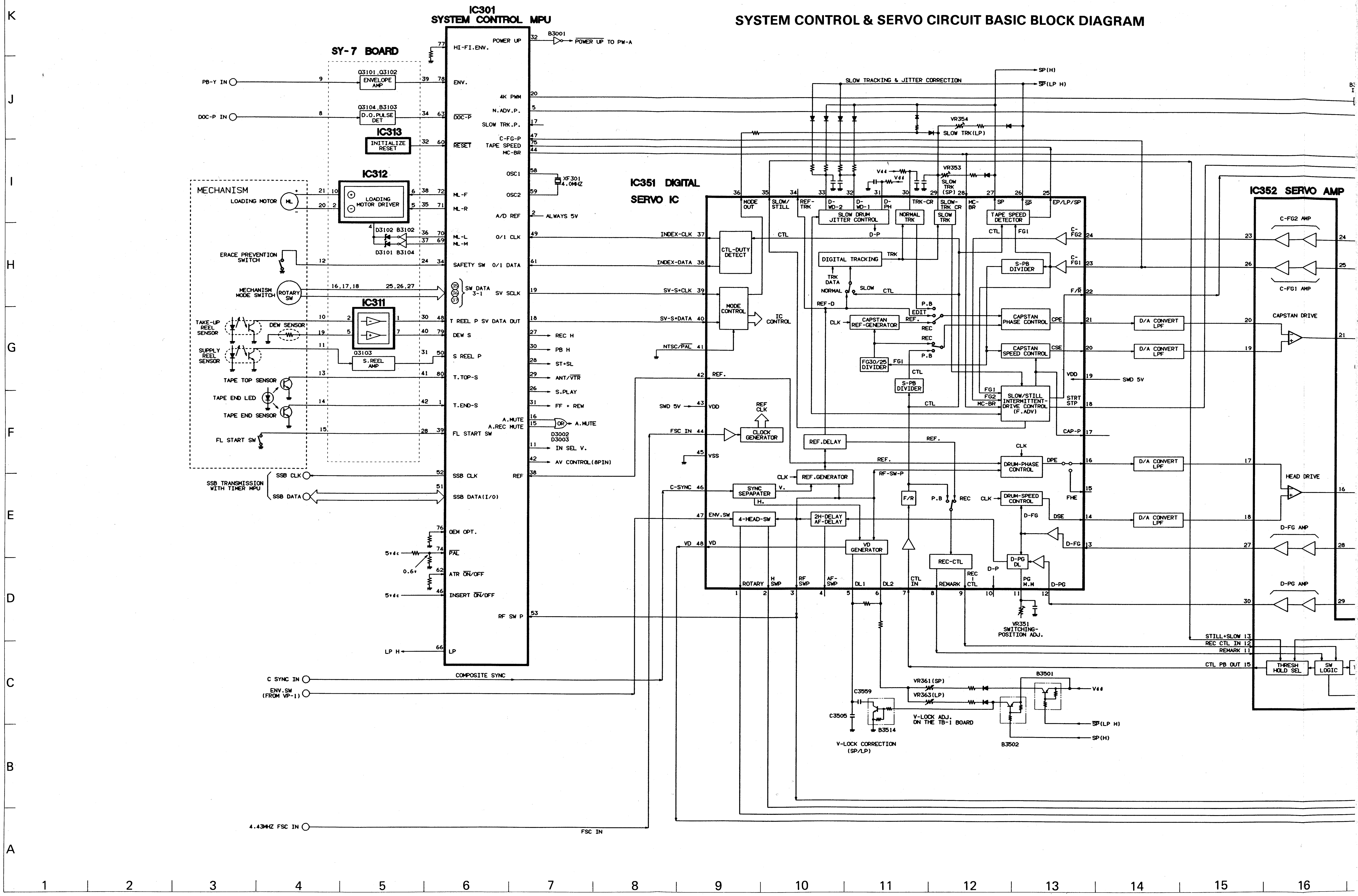
SYSTEM CONTROL & SERVO CIRCUIT BASIC BLOCK DIAGRAM


IC301
SYSTEM CONTROL MPU
SY-7 BOARD
PB-Y IN
DOC-P IN
Q3101,Q3102
ENVELOPE AMP
Q3104,B3103
D.O.PULSE DET
IC313
INITIALIZE RESET
IC312
LOADING MOTOR DRIVER
MECHANISM
LOADING MOTOR
ML
D3102 B3102
D3101 B3104
ERACE PREVENTION SWITCH
MECHANISM MODE SWITCH
ROTARY SW
IC311
TAKE-UP REEL SENSOR
DEW SENSOR
SUPPLY REEL SENSOR
Q3103
S.REEL AMP
TAPE TOP SENSOR
TAPE END LED
TAPE END SENSOR
FL START SW
SSB TRANSMISSION WITH TIMER MPU
SSB CLK
SSB DATA
HI-FI.ENV.
ENV.
DOC-P
RESET
ML-F
ML-R
ML-L
ML-M
SAFETY SW
SW DATA 3-1
T REEL P
DEW S
S REEL P
T.TOP-S
T.END-S
FL START SW
SSB CLK
SSB DATA(I/O)
OEM OPT.
PAL
ATR ON/OFF
INSERT ON/OFF
LP
POWER UP
4K PWM
N.ADV.P.
SLOW TRK.P.
C-FG-P
TAPE SPEED
MC-BR
OSC1
OSC2
A/D REF
0/1 CLK
0/1 DATA
SV SCLK
SV DATA OUT
A.MUTE
A.REC MUTE
REF
RF SW P
B3001
POWER UP TO PW-A
XF301 4.0MHZ
ALWAYS 5V
REC H
PB H
ST+SL
ANT/VTR
S.PLAY
FF + REW
A.MUTE
D3002 D3003
IN SEL V.
AV CONTROL(8PIN)
5Vdc
0.6V
LP H
C SYNC IN
COMPOSITE SYNC
ENV.SW (FROM VP-1)
4.43MHZ FSC IN
FSC IN
IC351 DIGITAL SERVO IC
INDEX-CLK
INDEX-DATA
SV-S+CLK
SV-S+DATA
NTSC/PAL
REF.
SWD 5V
VDD
FSC IN
VSS
C-SYNC
ENV.SW
VD
CTL-DUTY DETECT
MODE CONTROL
IC CONTROL
REF CLK
CLOCK GENERATOR
SYNC SEPAPATER
4-HEAD-SW
2H-DELAY AF-DELAY
VD GENERATOR
REF.DELAY
REF.GENERATOR
MODE OUT
SLOW/STILL
REF-TRK
D-WD-2
D-WD-1
D-PH
TRK-CR
SLOW-TRK CR
MC-BR
SP
EP/LP/SP
SLOW DRUM JITTER CONTROL
NORMAL TRK
SLOW TRK
TAPE SPEED DETECTOR
DIGITAL TRACKING
TRK DATA
NORMAL
SLOW
CTL
REF-D
EDIT
CAPSTAN REF-GENERATOR
P.B
REC
FG30/25 DIVIDER
S-PB DIVIDER
CAPSTAN PHASE CONTROL
CAPSTAN SPEED CONTROL
SLOW/STILL INTERMITTENT-DRIVE CONTROL (F.ADV)
S-PB DIVIDER
C-FG2
C-FG1
F/R
DRUM-PHASE CONTROL
DRUM-SPEED CONTROL
RF-SW-P
REC-CTL
D-PG DL
D-FG
DPE
DSE
FHE
CPE
CSE
STRT STP
CAP-P
ROTARY
H SWP
RF SWP
AF-SWP
DL1
DL2
CTL IN
REMARK
REC CTL
PG W.M
D-PG
SLOW TRACKING & JITTER CORRECTION
SP(H)
SP(LP H)
VR354
SLOW TRK(LP)
VR353
SLOW TRK (SP)
VR351 SWITCHING-POSITION ADJ.
C3559
C3505
B3514
V-LOCK CORRECTION (SP/LP)
VR361(SP)
VR363(LP)
V-LOCK ADJ. ON THE TB-1 BOARD
B3501
B3502
D/A CONVERT LPF
IC352 SERVO AMP
C-FG2 AMP
C-FG1 AMP
CAPSTAN DRIVE
HEAD DRIVE
D-FG AMP
D-PG AMP
STILL+SLOW
REC CTL IN
REMARK
CTL PB OUT
THRESH HOLD SEL
SW LOGIC
K
J
I
H
G
F
E
D
C
B
A
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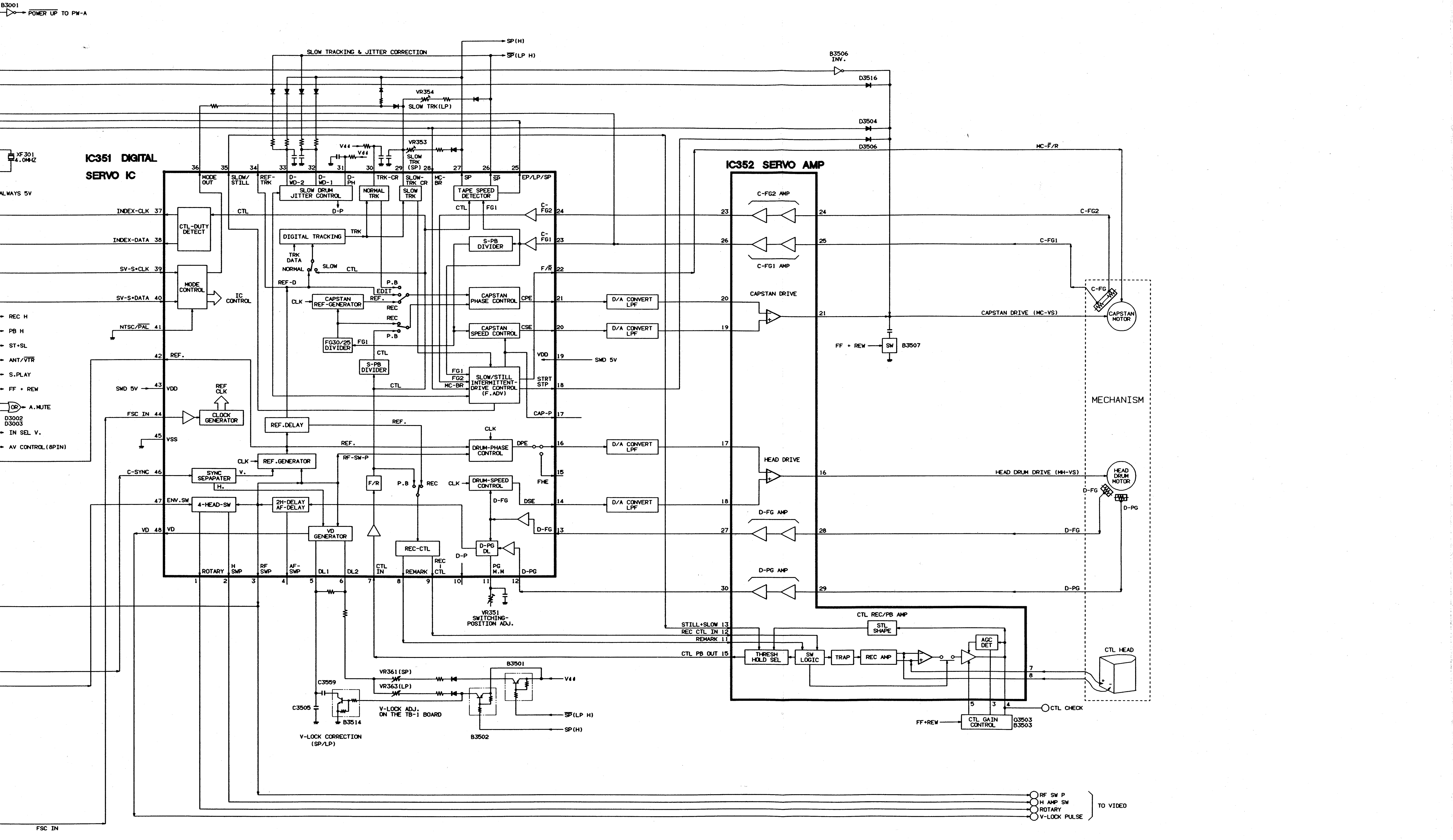
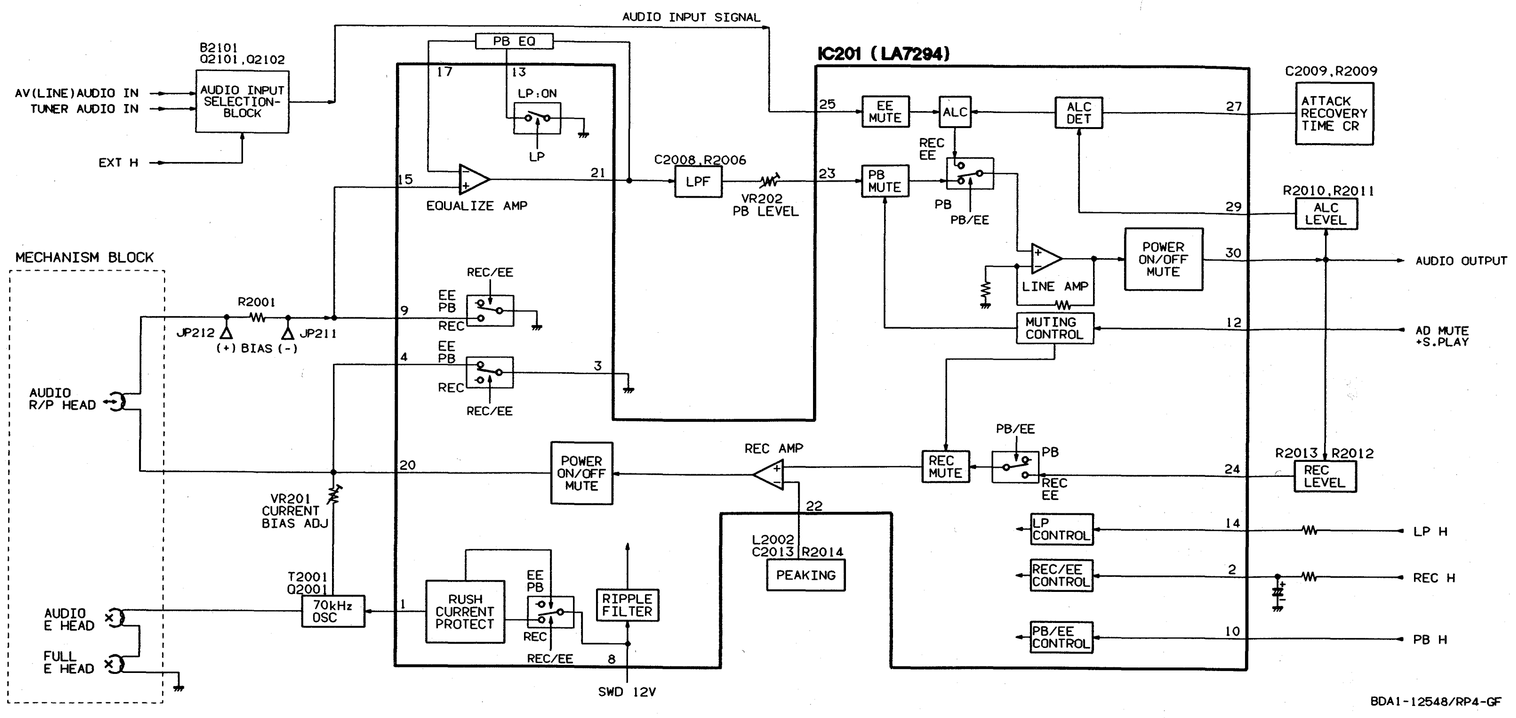
SYSTEM CONTROL & SERVO CIRCUIT BASIC BLOCK DIAGRAM

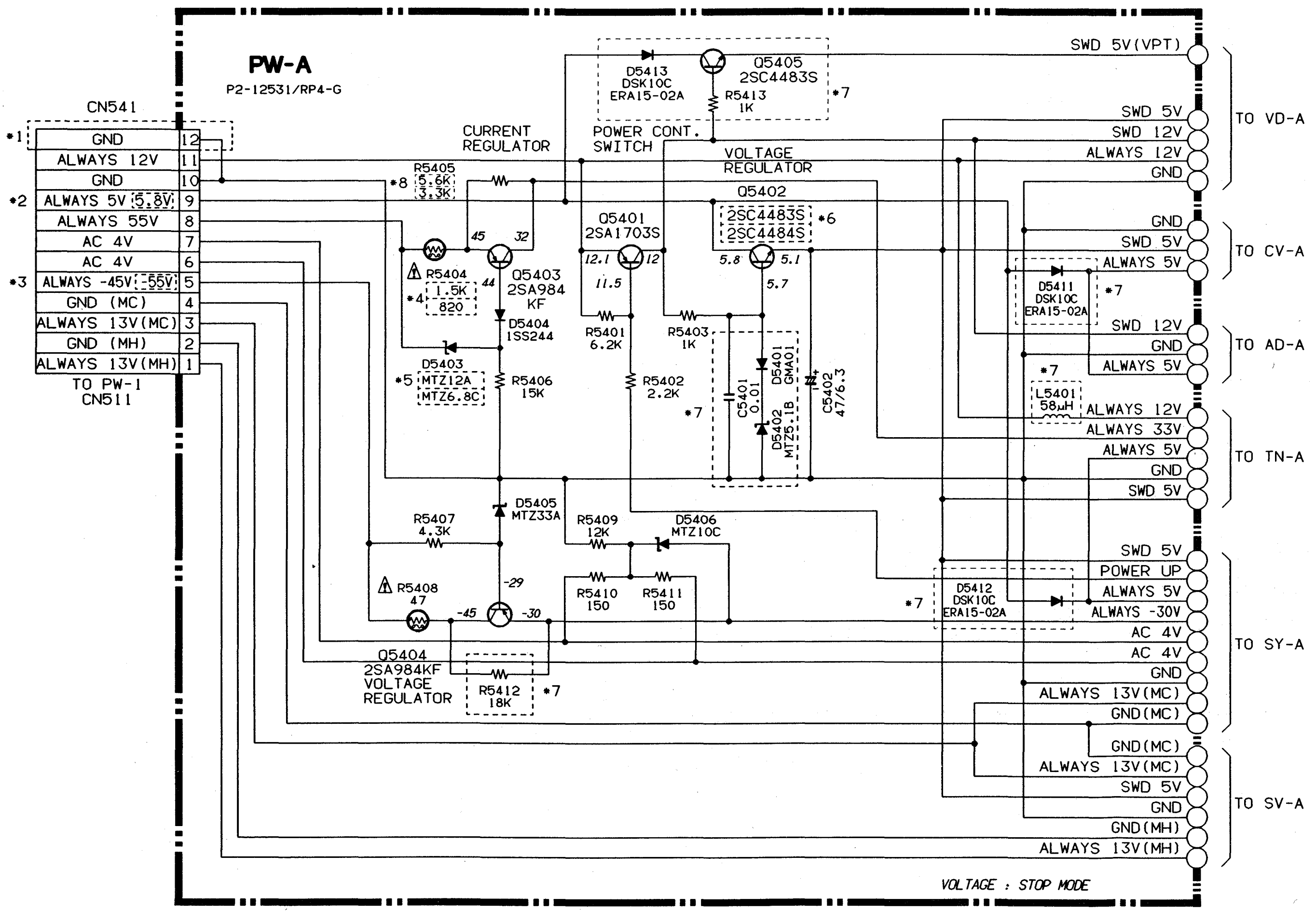

B3001
POWER UP TO PW-A
SLOW TRACKING & JITTER CORRECTION
SP(H)
SP(LP H)
B3506 INV.
D3516
D3504
D3506
MC-F/R
VR354
SLOW TRK(LP)
VR353
Vdd
SLOW TRK (SP)
XF301 4.0MHZ
IC351 DIGITAL SERVO IC
ALWAYS 5V
MODE OUT
SLOW/STILL
REF-TRK
D-WD-2
D-WD-1
D-PH
TRK-CR
SLOW-TRK CR
MC-BR
SP
SP
EP/LP/SP
SLOW DRUM JITTER CONTROL
NORMAL TRK
SLOW TRK
TAPE SPEED DETECTOR
INDEX-CLK 37
INDEX-DATA 38
SV-S•CLK 39
SV-S•DATA 40
NTSC/PAL 41
REF. 42
SWD 5V 43
VDD
FSC IN 44
45
VSS
C-SYNC 46
47 ENV.SW
VD 48
CTL-DUTY DETECT
MODE CONTROL
IC CONTROL
CTL
D-P
DIGITAL TRACKING
TRK
TRK DATA
NORMAL
SLOW
REF-D
EDIT
P.B
REC
CLK
CAPSTAN REF-GENERATOR
FG30/25 DIVIDER
FG1
S-PB DIVIDER
CAPSTAN PHASE CONTROL
CAPSTAN SPEED CONTROL
CPE
CSE
C-FG2 24
C-FG1 23
F/R 22
21
20
VDD 19
SWD 5V
FG1
FG2
MC-BR
SLOW/STILL INTERMITTENT-DRIVE CONTROL (F.ADV)
STRT STP 18
CAP-P 17
REF CLK
CLOCK GENERATOR
REF.DELAY
REF.
CLK
DRUM-PHASE CONTROL
DPE 16
15
FHE
REF.GENERATOR
RF-SW-P
SYNC SEPAPATER
V.
H.
4-HEAD-SW
2H-DELAY AF-DELAY
VD GENERATOR
F/R
P.B
REC
DRUM-SPEED CONTROL
D-FG
DSE 14
D-FG 13
REC-CTL
D-P
D-PG DL
ROTARY 1
H SWP 2
RF SWP 3
AF-SWP 4
DL1 5
DL2 6
CTL IN 7
REMARK 8
REC CTL 9
10
PG W.M 11
D-PG 12
VR351 SWITCHING-POSITION ADJ.
D/A CONVERT LPF
IC352 SERVO AMP
C-FG2 AMP
C-FG1 AMP
CAPSTAN DRIVE
HEAD DRIVE
D-FG AMP
D-PG AMP
23
24
26
25
20
19
21
17
16
18
27
28
30
29
C-FG2
C-FG1
C-FG
CAPSTAN DRIVE (MC-VS)
CAPSTAN MOTOR
FF • REW
SW
B3507
MECHANISM
HEAD DRUM DRIVE (MH-VS)
HEAD DRUM MOTOR
D-FG
D-PG
CTL REC/PB AMP
STL SHAPE
STILL•SLOW 13
REC CTL IN 12
REMARK 11
CTL PB OUT 15
THRESH HOLD SEL
SW LOGIC
TRAP
REC AMP
AGC DET
7
8
CTL HEAD
5
3
4
CTL CHECK
FF•REW
CTL GAIN CONTROL
Q3503 B3503
REC H
PB H
ST•SL
ANT/VTR
S.PLAY
FF • REW
OR
A.MUTE
D3002 D3003
IN SEL V.
AV CONTROL(8PIN)
B3501
VR361(SP)
VR363(LP)
Vdd
C3559
C3505
B3514
V-LOCK ADJ. ON THE TB-1 BOARD
V-LOCK CORRECTION (SP/LP)
B3502
SP(LP H)
SP(H)
RF SW P
H AMP SW
ROTARY
V-LOCK PULSE
TO VIDEO
FSC IN

BDS1-12548/RP4-GF

AUDIO CIRCUIT BASIC BLOCK DIAGRAM

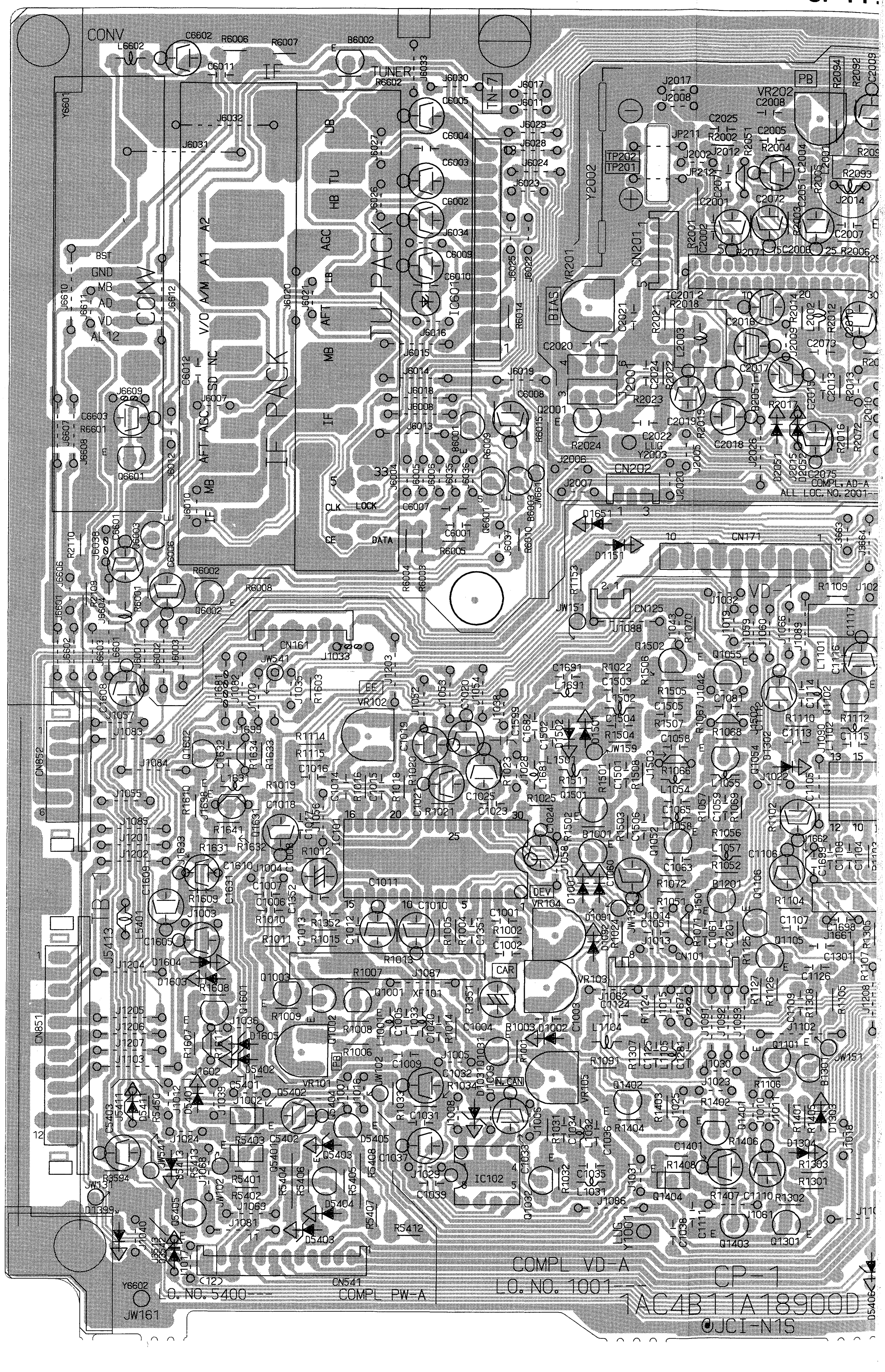

AUDIO INPUT SIGNAL
B2101
Q2101,Q2102
AV(LINE)AUDIO IN
TUNER AUDIO IN
AUDIO INPUT SELECTION-BLOCK
EXT H
PB EQ
LP:ON
LP
IC201 (LA7294)
EQUALIZE AMP
C2008,R2006
LPF
VR202 PB LEVEL
EE MUTE
ALC
ALC DET
PB MUTE
REC EE
PB
PB/EE
LINE AMP
POWER ON/OFF MUTE
MUTING CONTROL
C2009,R2009
ATTACK RECOVERY TIME CR
R2010,R2011
ALC LEVEL
AUDIO OUTPUT
AD MUTE
*S.PLAY
MECHANISM BLOCK
R2001
JP212
JP211
(+) BIAS (-)
REC/EE
EE PB
REC
AUDIO R/P HEAD
VR201 CURRENT BIAS ADJ
POWER ON/OFF MUTE
REC AMP
REC MUTE
R2013, R2012
REC LEVEL
L2002
C2013
R2014
PEAKING
LP CONTROL
LP H
REC/EE CONTROL
REC H
PB/EE CONTROL
PB H
T2001
Q2001
70kHz OSC
AUDIO E HEAD
FULL E HEAD
RUSH CURRENT PROTECT
RIPPLE FILTER
SWD 12V
BDA1-12548/RP4-GF

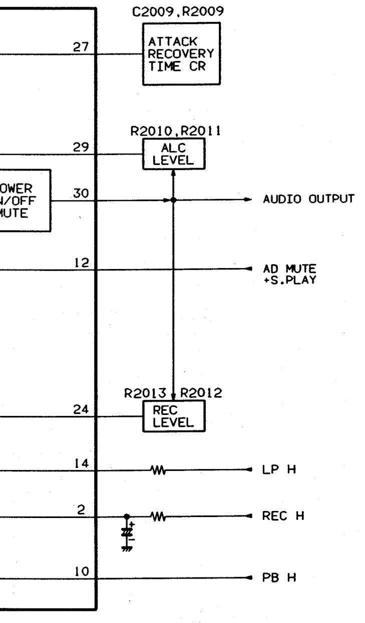
CP-1 BOARD (PW-A) POWER SUPPLY CIRCUIT DIAGRAM


PW-A
P2-12531/RP4-G
CN541
GND
ALWAYS 12V
GND
ALWAYS 5V
5.8V
ALWAYS 55V
AC 4V
AC 4V
ALWAYS -45V
-55V
GND (MC)
ALWAYS 13V(MC)
GND (MH)
ALWAYS 13V(MH)
TO PW-1 CN511
CURRENT REGULATOR
POWER CONT. SWITCH
VOLTAGE REGULATOR
D5413 DSK10C ERA15-02A
Q5405 2SC4483S
R5413 1K
R5405 5.6K 3.3K
Q5401 2SA1703S
Q5402 2SC4483S 2SC4484S
R5404 1.5K 820
Q5403 2SA984 KF
D5404 1SS244
D5403 MTZ12A MTZ6.8C
R5406 15K
R5401 6.2K
R5403 1K
R5402 2.2K
C5401 0.01
D5401 GMA01
D5402 MTZ5.1B
C5402 47/6.3
D5411 DSK10C ERA15-02A
L5401 58μH
D5405 MTZ33A
R5407 4.3K
R5409 12K
D5406 MTZ10C
R5408 47
R5410 150
R5411 150
Q5404 2SA984KF VOLTAGE REGULATOR
R5412 18K
D5412 DSK10C ERA15-02A
SWD 5V(VPT)
SWD 5V
SWD 12V
ALWAYS 12V
GND
TO VD-A
ALWAYS 5V
TO CV-A
TO AD-A
ALWAYS 33V
TO TN-A
POWER UP
ALWAYS -30V
TO SY-A
GND(MC)
GND(MH)
TO SV-A
VOLTAGE : STOP MODE

NOTE

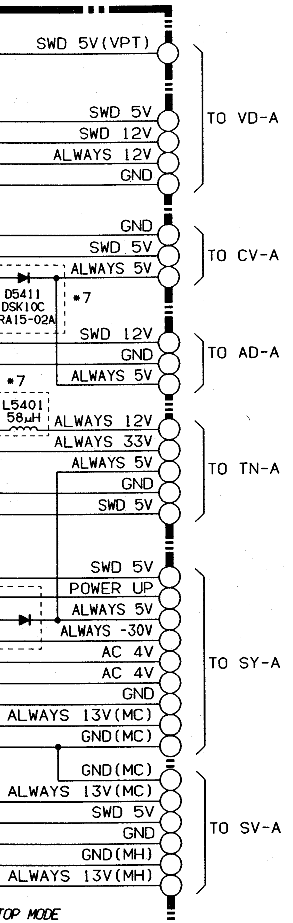
	*1 CN541	*2 CN541 9P	*3 CN541 5P	*4 R5404	*5 D5403	*6 Q5402	*7	*8 R5405
VHR-7500G VHR-7530G VHR-8500SP	11P	ALWAYS 5V	ALWAYS -45V	1.5K	MTZ12A	2SC4483S	NOT USE	5.6K
VHR-7540G	12P	ALWAYS 5.8V	ALWAYS -55V	820	MTZ6.8C	2SC4484S	USE	5.6K
VHR-7500EX	11P	ALWAYS 5V	ALWAYS -45V	820	MTZ12A	2SC4483S	NOT USE	3.3K


CONV
IF
TUNER
IF PACK
TU PACK
BIAS
CN201
CN202
CN171
CN161
CN852
CN851
IC101
IC102
VR201
VR202
VR101
VR102
VR103
VR104
VR105
COMPL VD-A
LO. NO. 1001
CN541
COMPL PW-A
LO. NO. 5400---
COMPL AD-A
ALL LOC. NO. 2001
CP-1
1AC4B11A18900D
JCI-N1S



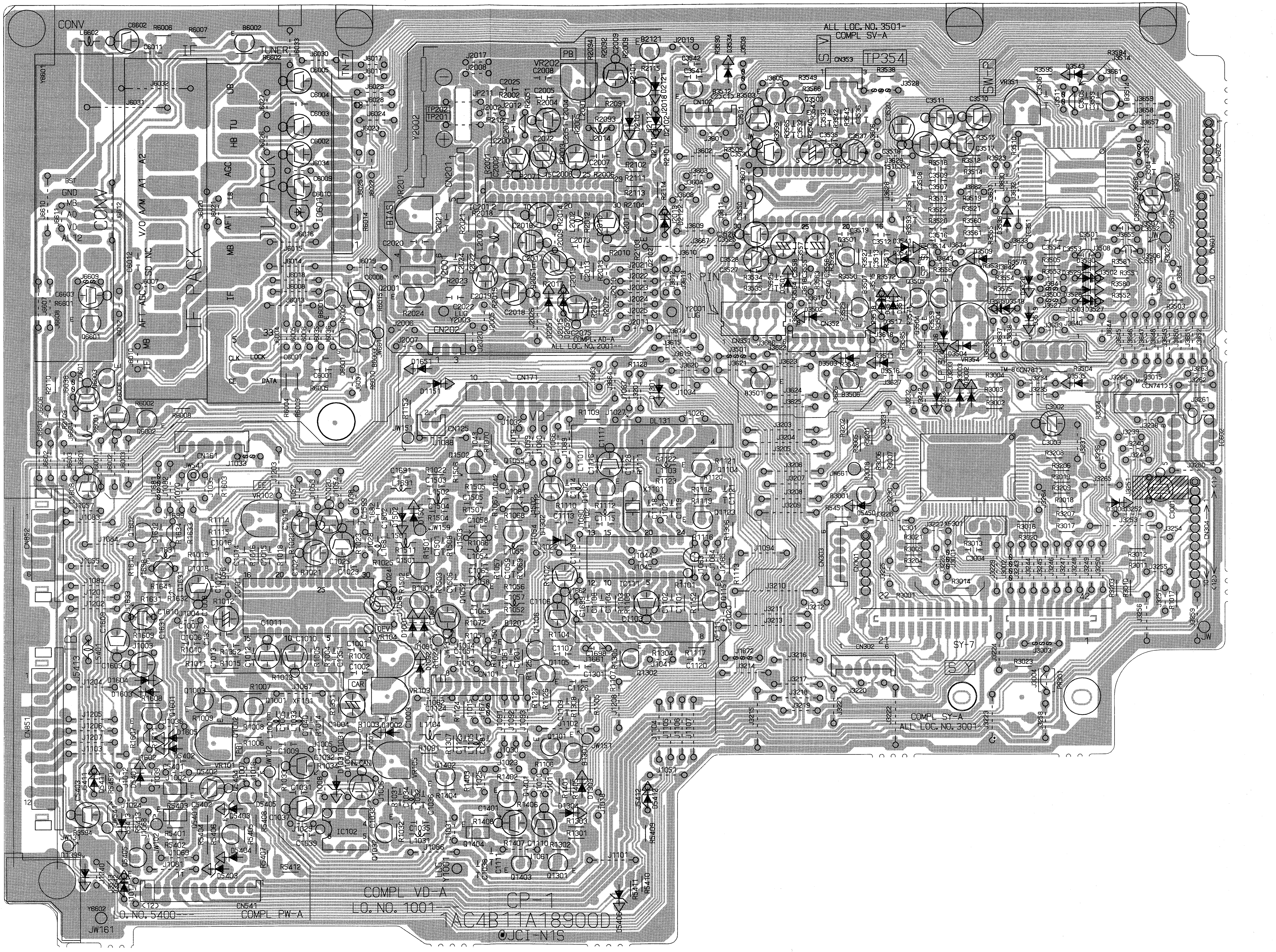
C2009,R2009
27
ATTACK RECOVERY TIME CR
R2010,R2011
29
ALC LEVEL
OWER
N/OFF
MUTE
30
AUDIO OUTPUT
12
AD MUTE +S.PLAY
R2013,R2012
24
REC LEVEL
14
LP H
2
REC H
10
PB H
BDA1-12548/RP4-GF

RAM



SWD 5V(VPT)
SWD 5V
SWD 12V
ALWAYS 12V
GND
TO VD-A
GND
SWD 5V
ALWAYS 5V
D5411
DSK10C
RA15-02A
•7
TO CV-A
SWD 12V
GND
ALWAYS 5V
TO AD-A
•7
L5401
58μH
ALWAYS 12V
ALWAYS 33V
ALWAYS 5V
GND
SWD 5V
TO TN-A
SWD 5V
POWER UP
ALWAYS 5V
ALWAYS -30V
AC 4V
AC 4V
GND
ALWAYS 13V(MC)
GND(MC)
TO SY-A
GND(MC)
ALWAYS 13V(MC)
SWD 5V
GND
GND(MH)
ALWAYS 13V(MH)
TO SV-A
TOP MODE

CP-1 P.C.B.



CONV
TUNER
IF PACK
TU PACK
ALL LOC. NO. 3501-
COMPL SV-A
TP354
ALL LOC. NO. 2001-
COMPL AD-A
VD-1
CN171
SY-7
COMPL SY-A
ALL LOC. NO. 3001-
COMPL VD-A
LO. NO. 1001-
LO. NO. 5400-
COMPL PW-A
CP-1
1AC4B11A18900D
JCI-N1S

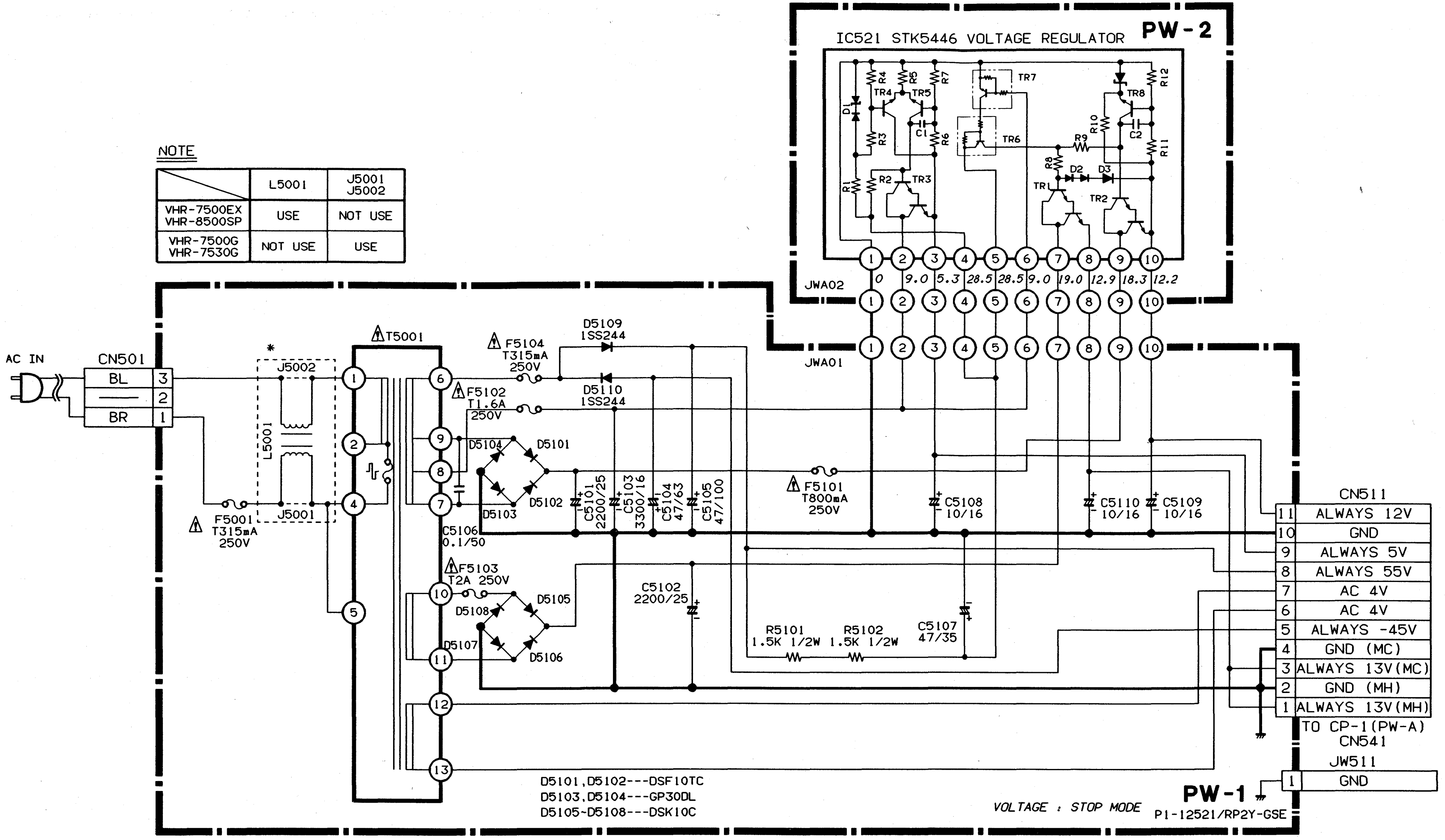
8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24

K J I H G F E D C B A

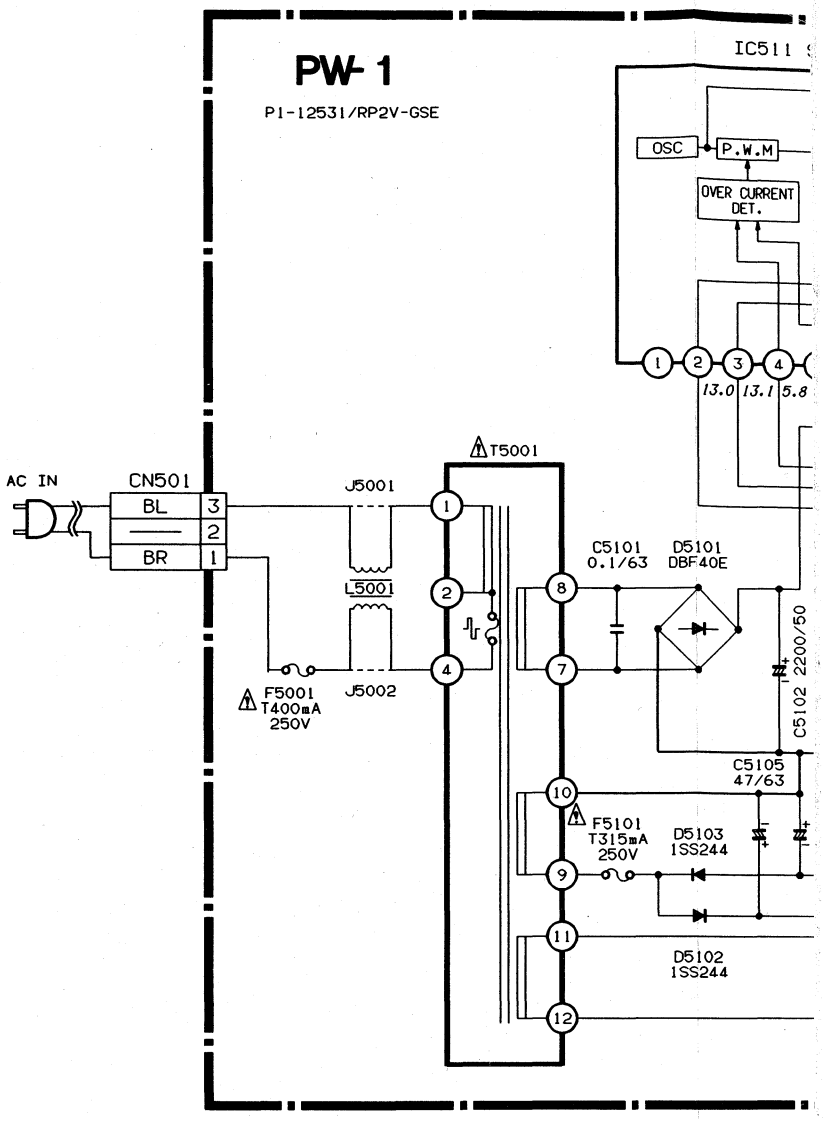
PW-1, 2 BOARD POWER SUPPLY CIRCUIT DIAGRAM (VHR-7500G, VHR-7500EX, VHR-7530G, VHR-8500SP)

NOTE

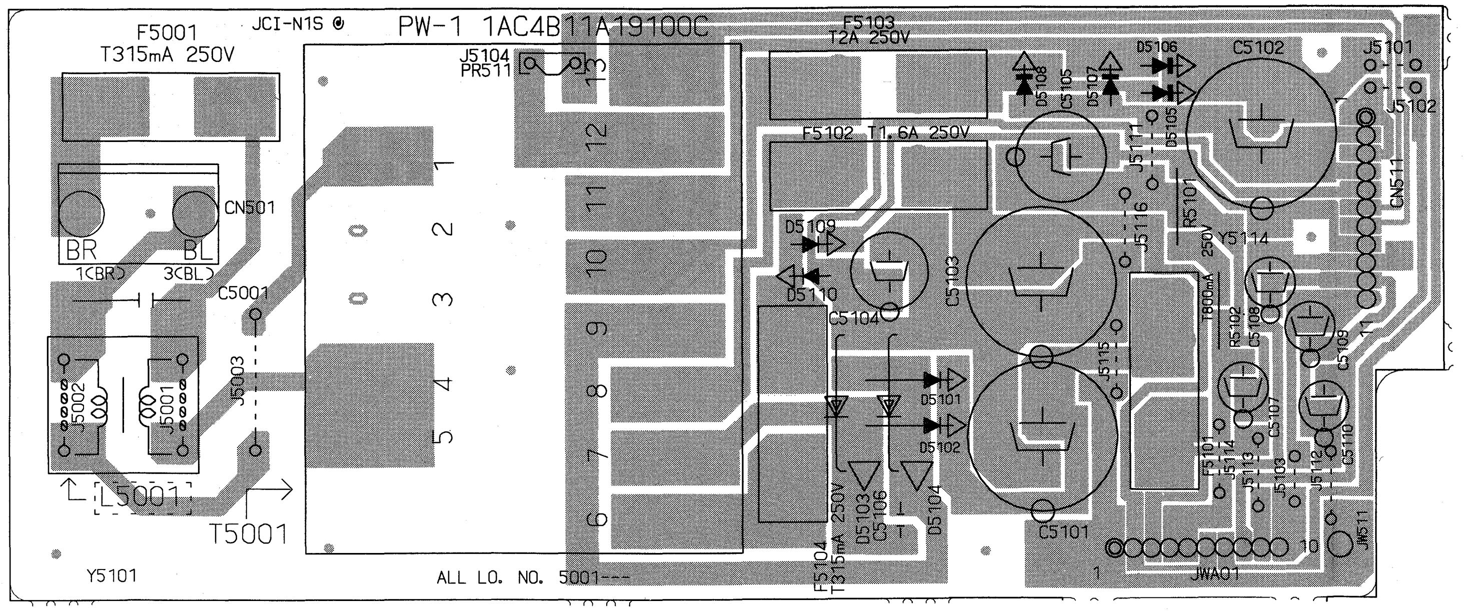
	L5001	J5001 J5002
VHR-7500EX VHR-8500SP	USE	NOT USE
VHR-7500G VHR-7530G	NOT USE	USE


IC521 STK5446 VOLTAGE REGULATOR
PW-2
TR1 TR2 TR3 TR4 TR5 TR6 TR7 TR8
R1 R2 R3 R4 R5 R6 R7 R8 R9 R10 R11 R12
C1 C2 D1 D2 D3
JWA02
0 9.0 5.3 28.5 28.5 9.0 19.0 12.9 18.3 12.2
JWA01
AC IN
CN501
BL
BR
J5002
L5001
J5001
F5001 T315mA 250V
T5001
F5104 T315mA 250V
F5102 T1.6A 250V
D5109 1SS244
D5110 1SS244
D5101 D5102 D5103 D5104
C5101 2200/25
C5103 3300/16
C5104 47/63
C5105 47/100
C5106 0.1/50
F5101 T800mA 250V
C5108 10/16
C5110 10/16
C5109 10/16
F5103 T2A 250V
D5105 D5106 D5107 D5108
C5102 2200/25
R5101 1.5K 1/2W
R5102 1.5K 1/2W
C5107 47/35
CN511
11 ALWAYS 12V
10 GND
9 ALWAYS 5V
8 ALWAYS 55V
7 AC 4V
6 AC 4V
5 ALWAYS -45V
4 GND (MC)
3 ALWAYS 13V(MC)
2 GND (MH)
1 ALWAYS 13V(MH)
TO CP-1(PW-A) CN541
JW511
1 GND
D5101,D5102---DSF10TC
D5103,D5104---GP30DL
D5105~D5108---DSK10C
VOLTAGE : STOP MODE
PW-1
P1-12521/RP2Y-GSE

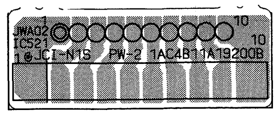
PW-1 BOARD POWER

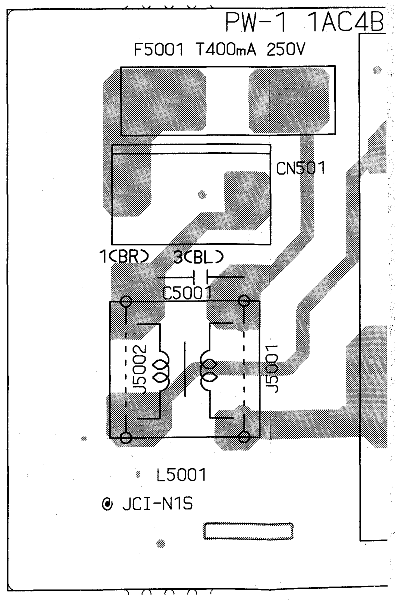

PW-1
P1-12531/RP2V-GSE
IC511
OSC
P.W.M
OVER CURRENT DET.
13.0 13.1 5.8
AC IN
CN501
BL
BR
T5001
J5001
L5001
J5002
F5001 T400mA 250V
C5101 0.1/63
D5101 DBF40E
C5102 2200/50
C5105 47/63
F5101 T315mA 250V
D5103 1SS244
D5102 1SS244

PW-1 P.C.B. (VHR-7500G, VHR-7500EX, VHR-7530G, VHR-8500SP)


F5001 T315mA 250V
JCI-N1S
PW-1 1AC4B11A19100C
J5104 PR511
F5103 T2A 250V
F5102 T1.6A 250V
CN501
BR BL
1(BR) 3(BL)
C5001
J5002 J5001 J5003
L5001
T5001
Y5101
ALL LO. NO. 5001---
D5109 D5110 C5104 C5103
D5101 D5102 D5103 C5106 D5104
F5104 T315mA 250V
C5101 C5102
D5105 D5106 D5107 D5108
J5101 J5102 CN511
R5101 Y5114 J5111 J5116 J5115
F5101 T800mA 250V
R5102 C5108 C5109 C5107 C5110
J5113 J5112 J5114
JW511
JWA01
1 10

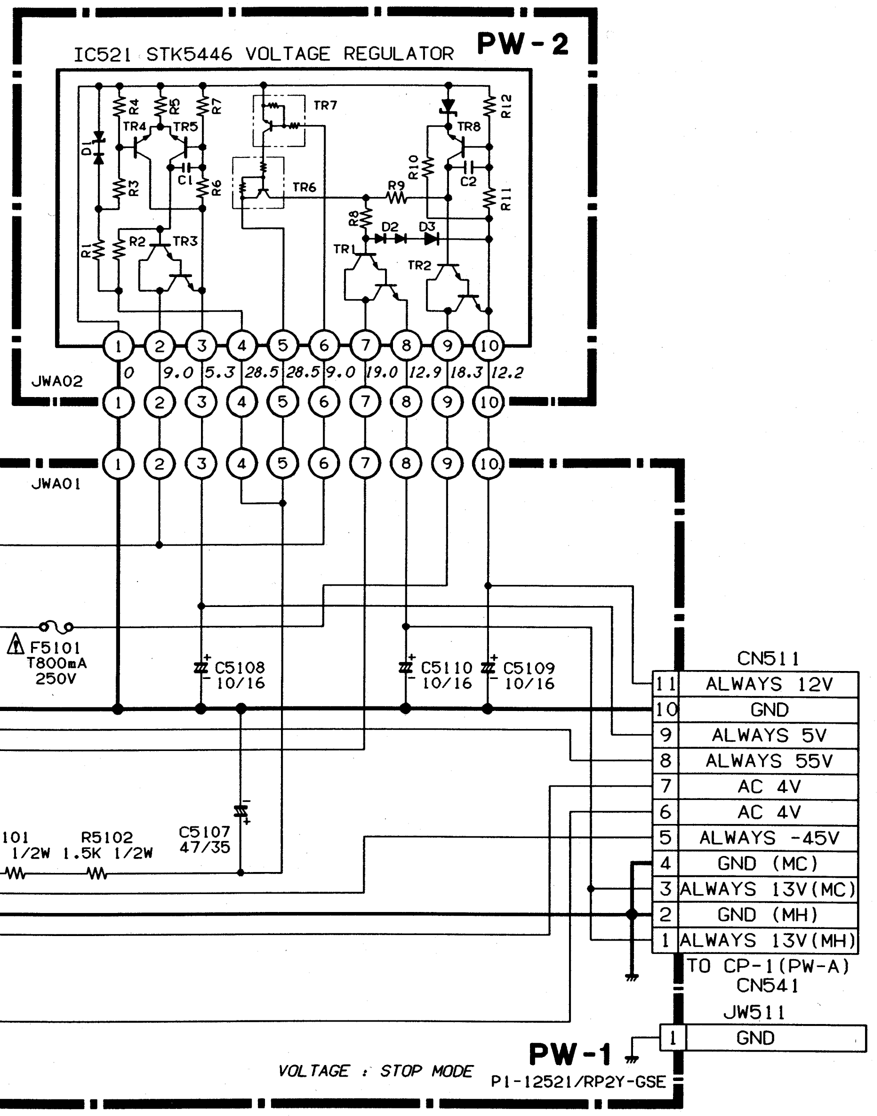
PW-2 P.C.B. (VHR-7500G, VHR-7500EX, VHR-7530G, VHR-8500SP)


JWA02
IC521
JCI-N1S
PW-2 1AC4B11A19200B
1 10

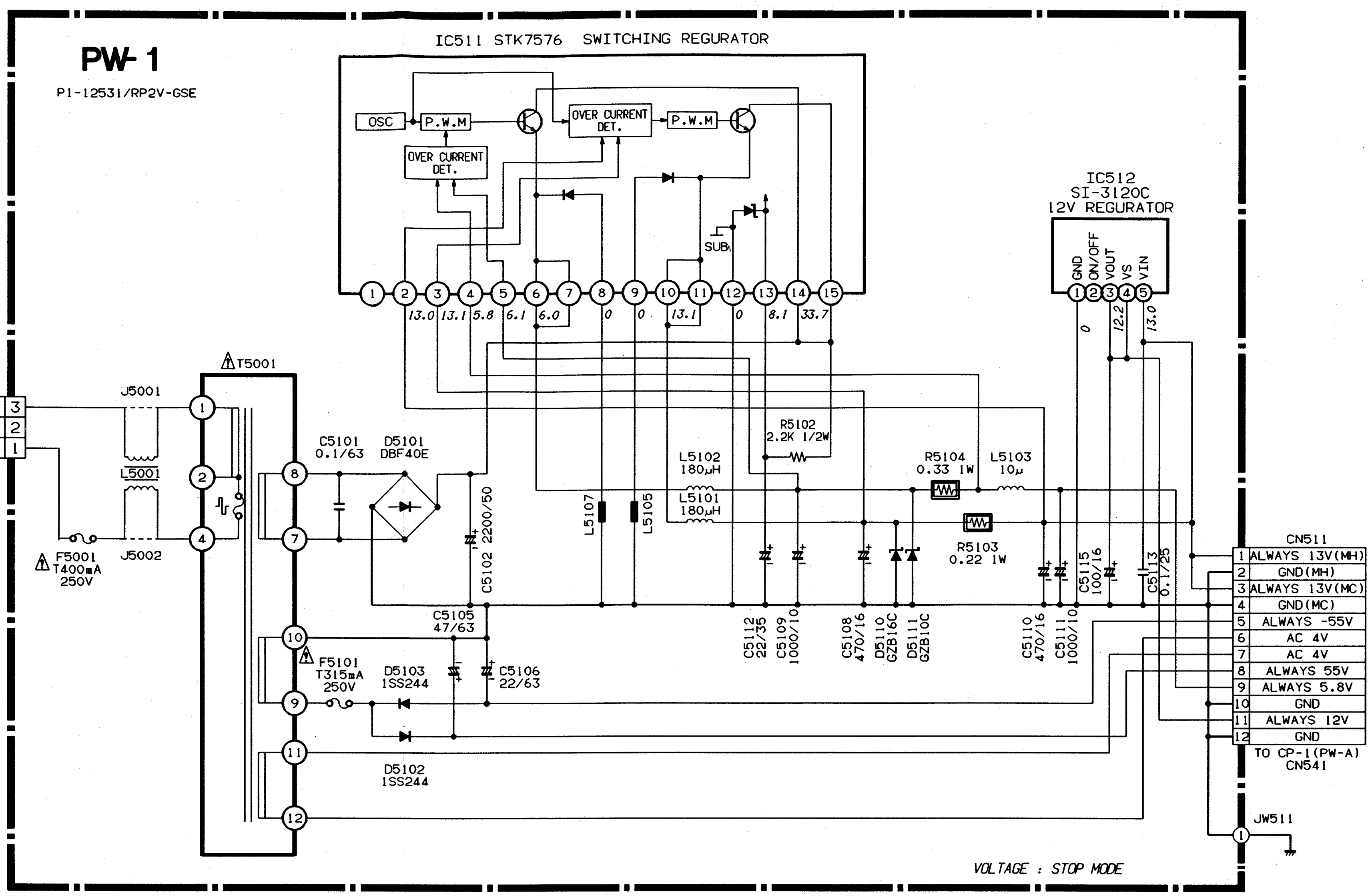

PW-1 1AC4B
F5001 T400mA 250V
CN501
1(BR) 3(BL)
C5001
J5002 J5001
L5001
JCI-N1S

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16

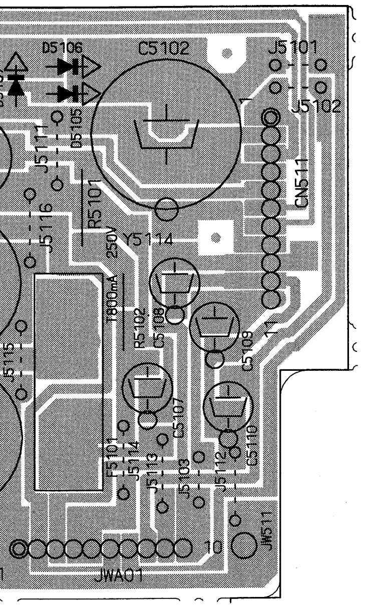
AM (VHR-7500G, VHR-7500EX, VHR-7530G,


IC521 STK5446 VOLTAGE REGULATOR
PW-2
TR4 TR5 TR7 TR8 TR6 TR3 TR1 TR2
R1 R2 R3 R4 R5 R6 R7 R8 R9 R10 R11 R12 D1 D2 D3 C1 C2
0 9.0 5.3 28.5 28.5 9.0 19.0 12.9 18.3 12.2
JWA02
JWA01
F5101 T800mA 250V
C5108 10/16
C5110 10/16
C5109 10/16
C5107 47/35
R5102 1.5K 1/2W
CN511
11 ALWAYS 12V
10 GND
9 ALWAYS 5V
8 ALWAYS 55V
7 AC 4V
6 AC 4V
5 ALWAYS -45V
4 GND (MC)
3 ALWAYS 13V(MC)
2 GND (MH)
1 ALWAYS 13V(MH)
TO CP-1(PW-A) CN541
JW511
1 GND
PW-1
P1-12521/RP2Y-GSE
VOLTAGE : STOP MODE

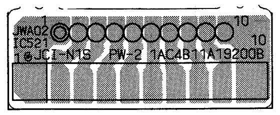
PW-1 BOARD POWER SUPPLY CIRCUIT DIAGRAM (VHR-7540G)


PW-1
P1-12531/RP2V-GSE
IC511 STK7576 SWITCHING REGURATOR
OSC
P.W.M
OVER CURRENT DET.
SUB
13.0 13.1 5.8 6.1 6.0 0 0 13.1 0 8.1 33.7
IC512 SI-3120C 12V REGURATOR
GND ON/OFF VOUT VS VIN
0 12.2 13.0
AC IN
CN501
BL BR
J5001
L5001
J5002
F5001 T400mA 250V
T5001
C5101 0.1/63
D5101 DBF40E
C5102 2200/50
C5105 47/63
F5101 T315mA 250V
D5103 1SS244
C5106 22/63
D5102 1SS244
L5107 L5105
L5102 180µH
L5101 180µH
R5102 2.2K 1/2W
R5104 0.33 1W
L5103 10µ
R5103 0.22 1W
C5112 22/35
C5109 1000/10
C5108 470/16
D5110 GZB16C
D5111 GZB10C
C5110 470/16
C5111 1000/10
C5115 100/16
C5113 0.1/25
CN511
1 ALWAYS 13V(MH)
2 GND(MH)
3 ALWAYS 13V(MC)
4 GND(MC)
5 ALWAYS -55V
6 AC 4V
7 AC 4V
8 ALWAYS 55V
9 ALWAYS 5.8V
10 GND
11 ALWAYS 12V
12 GND
TO CP-1(PW-A) CN541
JW511
VOLTAGE : STOP MODE

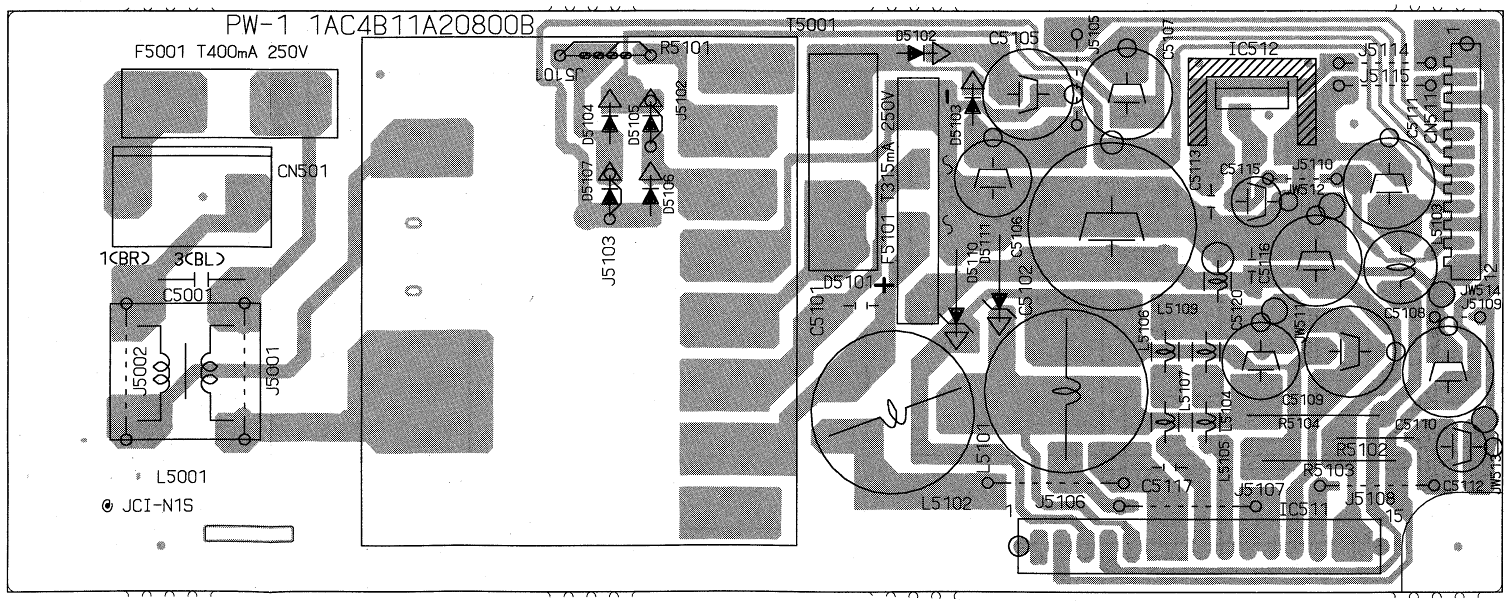
HR-8500SP)


D5106
C5102
J5101
J5102
D5105
J5111
R5101
J5116
CN511
J5114
T800mA
250V
J5115
D5102
C5108
C5107
C5109
F5101
J5113
J5103
J5112
C5110
JW511
JWA01
10

PW-2 P.C.B. (VHR-7500G, VHR-7500EX, VHR-7530G, VHR-8500SP)

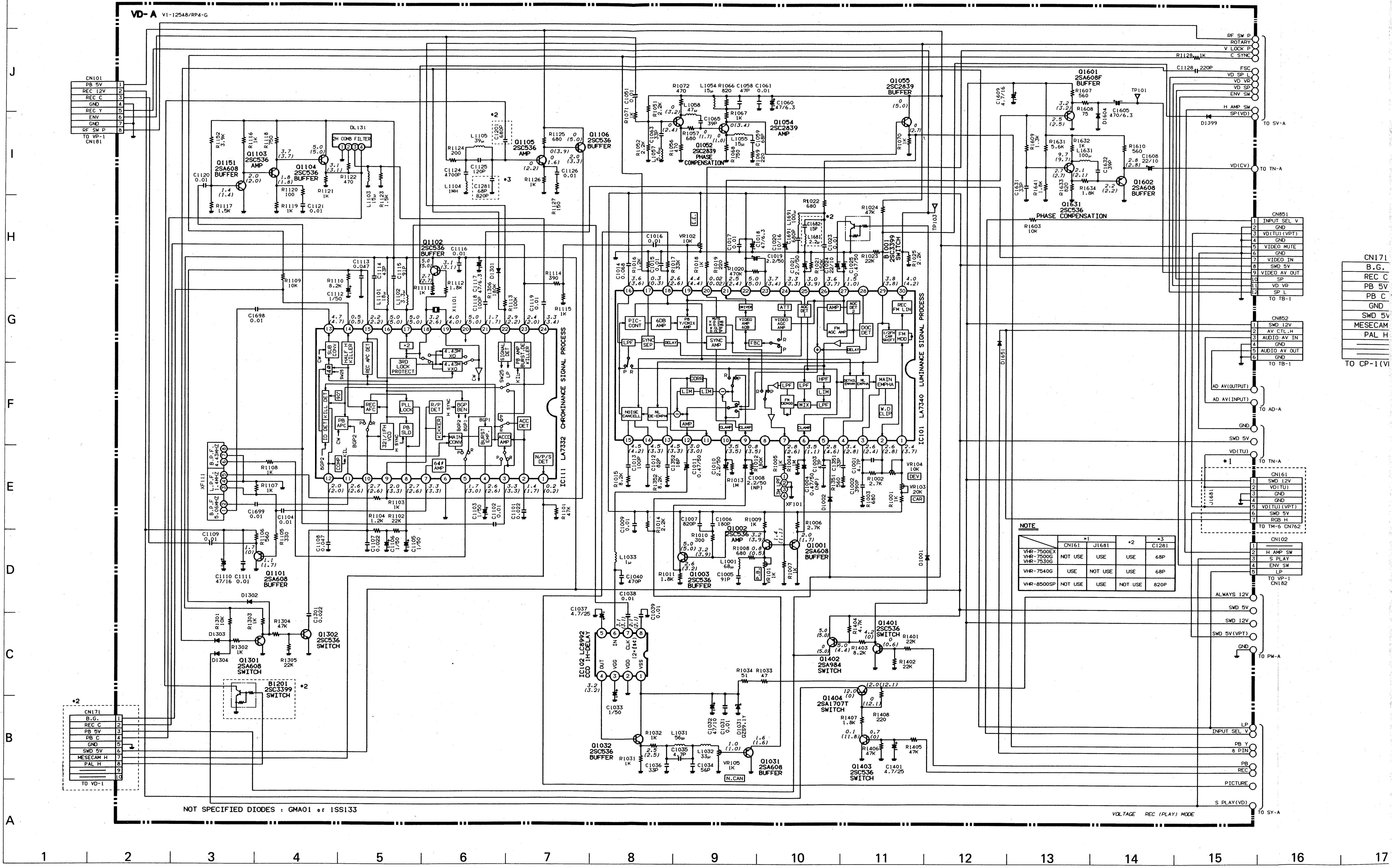

JWA02
IC521
JCI-N1S
PW-2 1AC4B11A19200B
10

PW-1 P.C.B. (VHR-7540G)


PW-1 1AC4B11A20800B
F5001 T400mA 250V
CN501
1(BR) 3(BL)
C5001
J5002
J5001
L5001
JCI-N1S
T5001
R5101
J5101
D5104 D5107 D5105 D5106
J5102
J5103
D5102
C5105
F5101 T315mA 250V
D5101
C5101
C5102
D5110 D5111
C5106
IC512
J5114 J5115
C5115
J5110
J5112
C5111
C5116
L5109
L5106
L5107
L5104
L5105
C5109
R5104
R5102
R5103
L5101
L5102
J5106
C5117
J5107
IC511
J5108
C5110
C5112
JW511
J5109
C5108
15

7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23

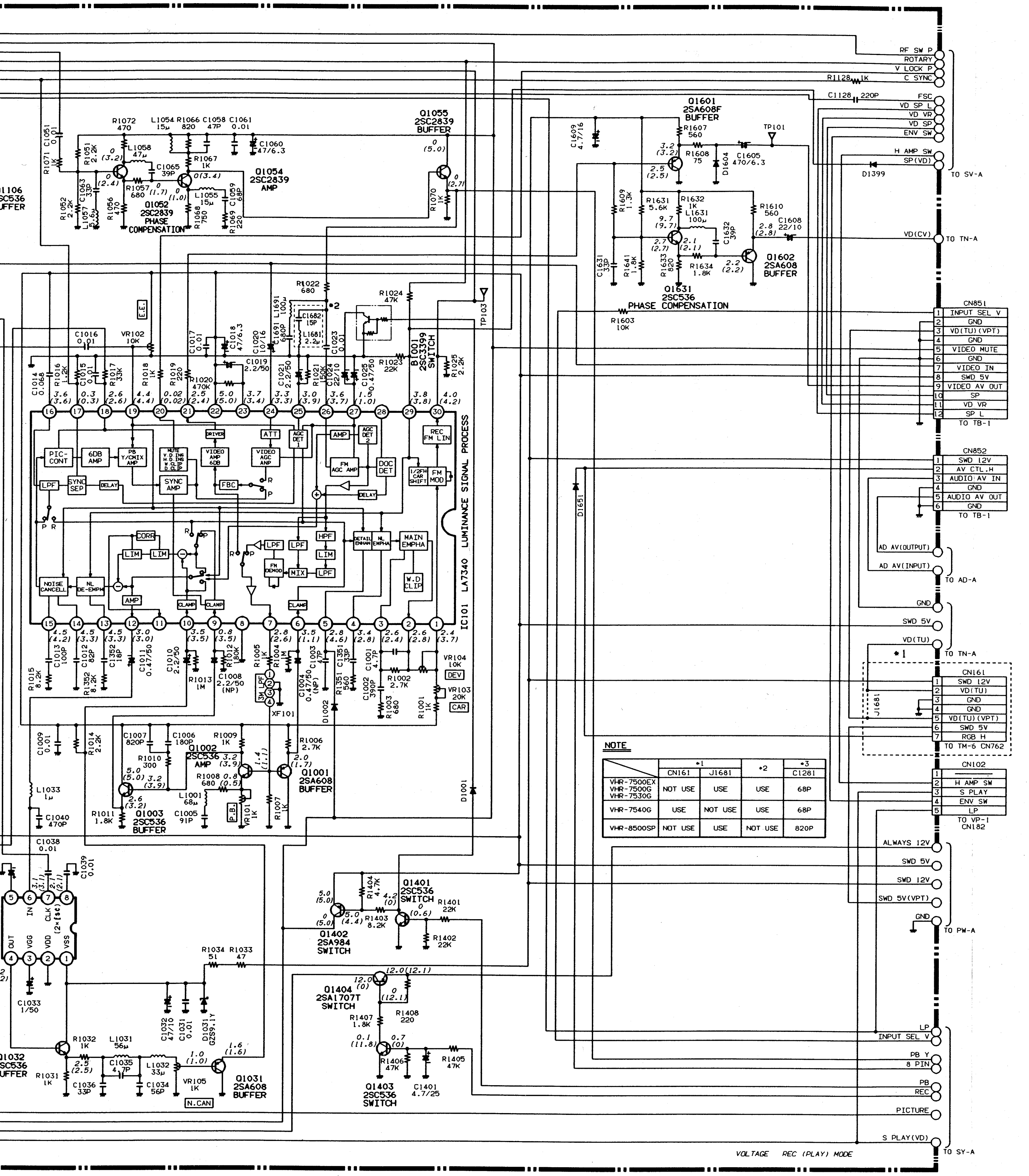
CP-1 BOARD (VD-A) VIDEO CIRCUIT DIAGRAM


VD-A V1-12548/RP4-G
CN101
PB 5V
REC 12V
REC C
GND
REC Y
ENV
GND
RF SW P
TO VP-1 CN181
Q1151 2SA608 BUFFER
Q1103 2SC536 AMP
Q1104 2SC536 BUFFER
DL131 2H COMB FILTER
Q1105 2SC536 AMP
Q1106 2SC536 BUFFER
Q1102 2SC536 BUFFER
IC111 LA7332 CHROMINANCE SIGNAL PROCESS
SUB CONV
HALF H KILLER
REC APC DET
3RD LOCK PROTECT
4.43M XO
4.43M VXO
SIGNAL DET
PB AMP BURST DE KILLER
ID DET
KILL DET
REC AFC
PLL LOCK
R/P DET
BGP BEN
PB APC
32f FH VCO
PB SLD
KIKKER
MAIN CONV
BURST EMP
ACCD AMP
ACC DET
COMP
64f AMP
N/P/S DET
XF111
B.P.F. 4.43MHZ
L.P.F. 1.4MHZ
B.P.F. 5.06MHZ
Q1101 2SA608 BUFFER
Q1301 2SA608 SWITCH
Q1302 2SC536 SWITCH
B1201 2SC3399 SWITCH
CN171
B.G.
REC C
PB 5V
PB C
GND
SWD 5V
MESECAM H
PAL H
TO VD-1
Q1052 2SC2839 PHASE COMPENSATION
Q1054 2SC2839 AMP
Q1055 2SC2839 BUFFER
IC101 LA7340 LUMINANCE SIGNAL PROCESS
PIC-CONT
6DB AMP
PB Y/CMIX AMP
VIDEO AMP 6DB
VIDEO AGC AMP
ATT
AGC DET
FM AGC AMP
DOC DET
REC FM LIN
1/2FH CAR SHIFT
FM MOD
SYNC SEP
SYNC AMP
FBC
DELAY
CORR
LIM
LPF
HPF
FM DEMOD
MIX
DETAIL ENHAN
NL EMPHA
MAIN EMPHA
W.D CLIP
NOISE CANCELL
NL DE-EMPH
AMP
CLAMP
B1001 2SC3399 SWITCH
XF101
Q1002 2SC536 AMP
Q1001 2SA608 BUFFER
Q1003 2SC536 BUFFER
IC102 LC8992 CCD 1H-DELAY
Q1032 2SC536 BUFFER
Q1031 2SA608 BUFFER
N.CAN
Q1601 2SA608F BUFFER
Q1631 2SC536 PHASE COMPENSATION
Q1602 2SA608 BUFFER
Q1401 2SC536 SWITCH
Q1402 2SA984 SWITCH
Q1404 2SA1707T SWITCH
Q1403 2SC536 SWITCH
RF SW P
ROTARY
V LOCK P
C SYNC
FSC
VD SP L
VD VR
VD SP
ENV SW
H AMP SW
SP(VD)
TO SV-A
VD(CV)
TO TN-A
CN851
INPUT SEL V
GND
VD(TU)(VPT)
GND
VIDEO MUTE
GND
VIDEO IN
SWD 5V
VIDEO AV OUT
SP
VD VR
SP L
TO TB-1
CN852
SWD 12V
AV CTL H
AUDIO AV IN
GND
AUDIO AV OUT
GND
TO TB-1
AD AV(OUTPUT)
AD AV(INPUT)
TO AD-A
GND
SWD 5V
VD(TU)
TO TN-A
CN161
SWD 12V
VD(TU)
GND
GND
VD(TU)(VPT)
SWD 5V
RGB H
TO TM-6 CN762
CN102
H AMP SW
S PLAY
ENV SW
LP
TO VP-1 CN182
ALWAYS 12V
SWD 5V
SWD 12V
SWD 5V(VPT)
GND
TO PW-A
LP
INPUT SEL V
PB Y
8 PIN
PB
REC
PICTURE
S PLAY(VD)
TO SY-A
CN171
B.G.
REC C
PB 5V
PB C
GND
SWD 5V
MESECAM H
PAL H
TO CP-1(VI
NOT SPECIFIED DIODES : GMA01 or 1SS133
VOLTAGE REC (PLAY) MODE
K
J
I
H
G
F
E
D
C
B
A
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17

NOTE

	*1		*2	*3
	CN161	J1681		C1281
VHR-7500EX VHR-7500G VHR-7530G	NOT USE	USE	USE	68P
VHR-7540G	USE	NOT USE	USE	68P
VHR-8500SP	NOT USE	USE	NOT USE	820P

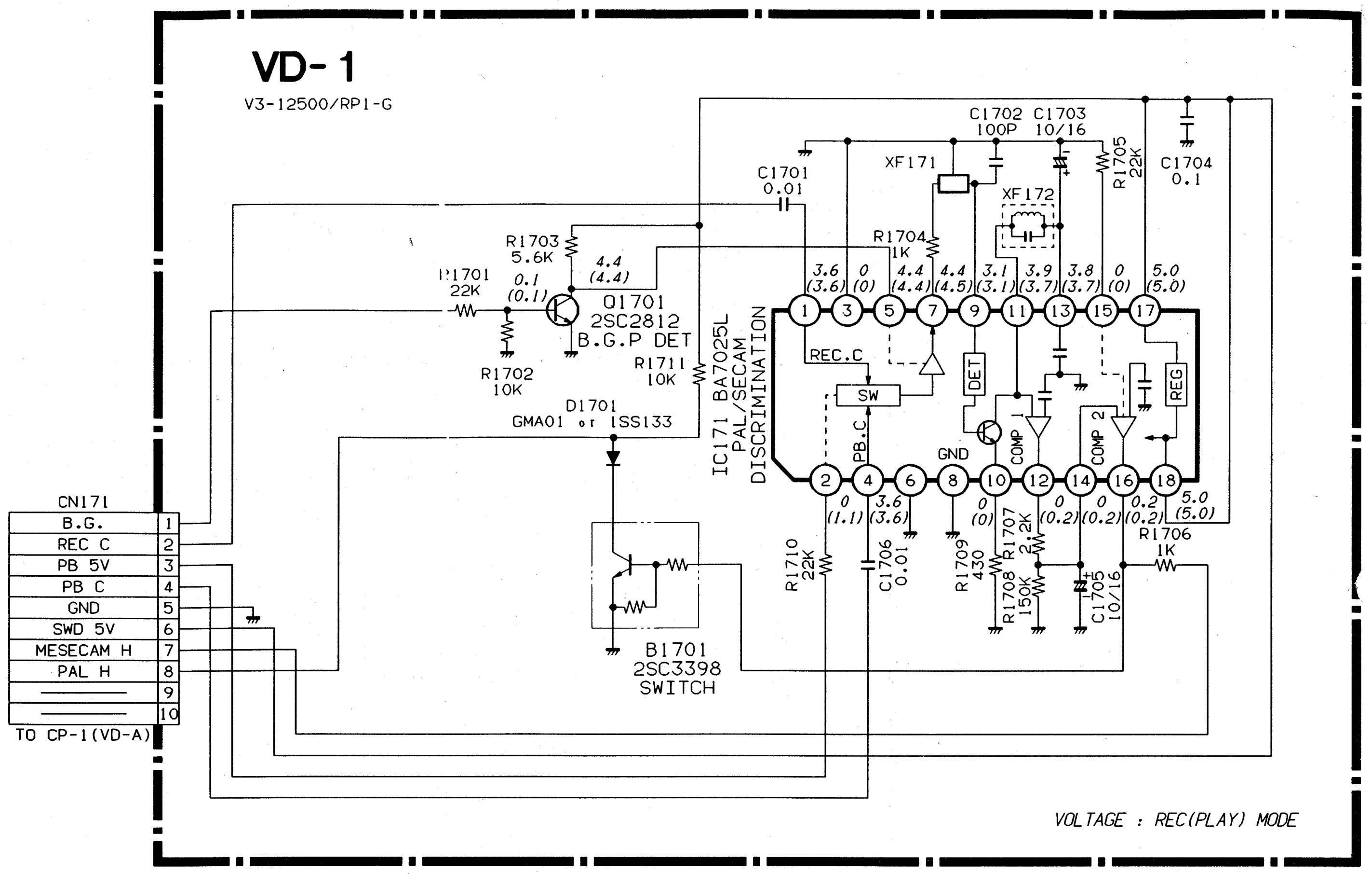
RD (VD-A) VIDEO CIRCUIT DIAGRAM


RF SW P
ROTARY
V LOCK P
C SYNC
FSC
VD SP L
VD VR
VD SP
ENV SW
H AMP SW
SP(VD)
TO SV-A
VD(CV)
TO TN-A
CN851
TO TB-1
CN852
TO TB-1
AD AV(OUTPUT)
AD AV(INPUT)
TO AD-A
GND
SWD 5V
VD(TU)
TO TN-A
CN161
TO TM-6 CN762
CN102
TO VP-1 CN182
ALWAYS 12V
SWD 5V
SWD 12V
SWD 5V(VPT)
GND
TO PW-A
LP
INPUT SEL V
PB Y
8 PIN
PB
REC
PICTURE
S PLAY(VD)
TO SY-A
Q1055 2SC2839 BUFFER
Q1054 2SC2839 AMP
Q1052 2SC2839 PHASE COMPENSATION
Q1601 2SA608F BUFFER
Q1602 2SA608 BUFFER
Q1631 2SC536 PHASE COMPENSATION
Q1002 2SC536 AMP
Q1001 2SA608 BUFFER
Q1003 2SC536 BUFFER
Q1401 2SC536 SWITCH
Q1402 2SA984 SWITCH
Q1404 2SA1707T SWITCH
Q1403 2SC536 SWITCH
Q1032 2SC536 BUFFER
Q1031 2SA608 BUFFER
IC101 LA7340 LUMINANCE SIGNAL PROCESS
VOLTAGE REC (PLAY) MODE

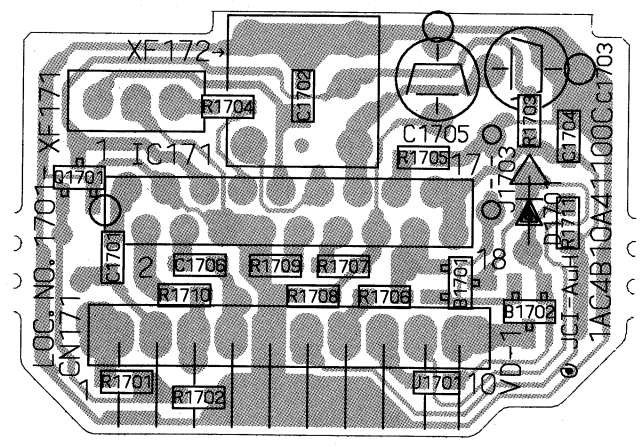
NOTE

	*1		*2	*3
	CN161	J1681		C1281
VHR-7500EX VHR-7500G VHR-7530G	NOT USE	USE	USE	68P
VHR-7540G	USE	NOT USE	USE	68P
VHR-8500SP	NOT USE	USE	NOT USE	820P

VD-1 BOARD PAL/SECAM DISCRIMINATION CIRCUIT DIAGRAM (VHR-7500G, VHR-7500EX, VHR-7530G, VHR-7540G)

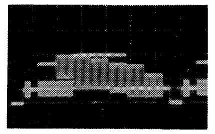
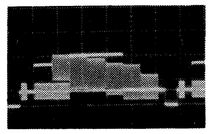
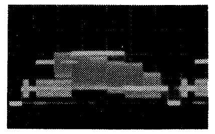
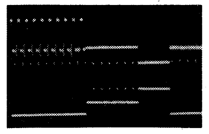
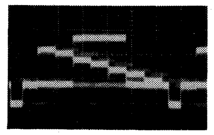
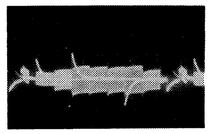
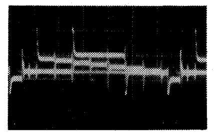
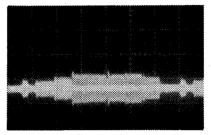
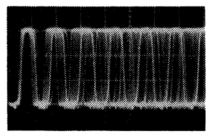
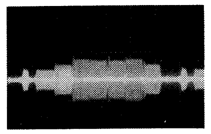
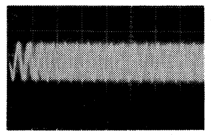
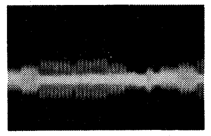
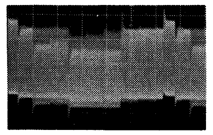
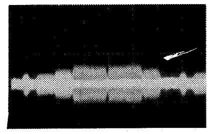
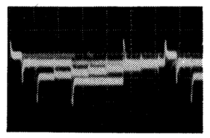
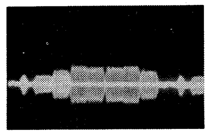
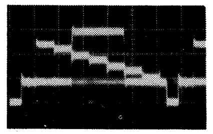
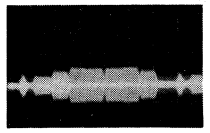
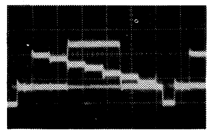
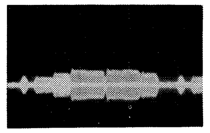
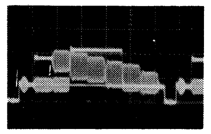
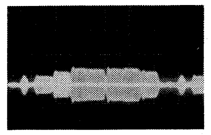

VD-1
V3-12500/RP1-G
CN171
B.G.
REC C
PB 5V
PB C
GND
SWD 5V
MESECAM H
PAL H
TO CP-1(VD-A)
Q1701 2SC2812 B.G.P DET
D1701 GMA01 or 1SS133
B1701 2SC3398 SWITCH
IC171 BA7025L PAL/SECAM DISCRIMINATION
XF171
XF172
REC.C
SW
DET
COMP 1
COMP 2
REG
PB.C
GND
VOLTAGE : REC(PLAY) MODE

VD-1 P.C.B. (VHR-7500G, VHR-7500EX, VHR-7530G, VHR-7540G)

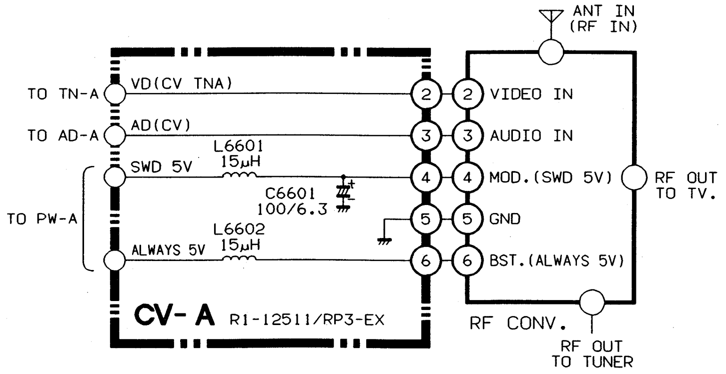

XF172
XF171
IC171
CN171
C1705
LOC.NO.1701
1AC4B10A4100C
VD-1

WAVEFORM OF VIDEO

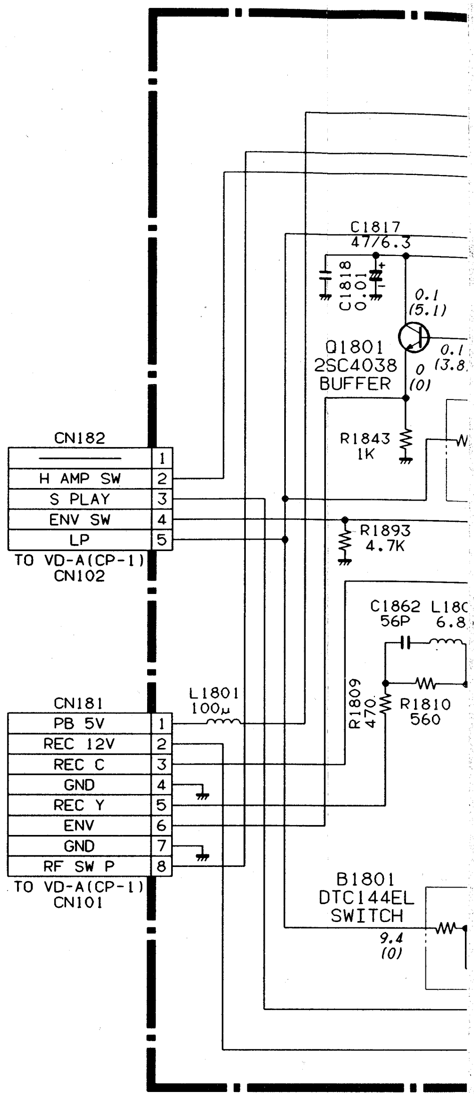
WF-V5

TEST LOCATION	WAVEFORM	MODE/LEVEL	TEST LOCATION	WAVEFORM	MODE/LEVEL
IC101 Pin 24		REC, EE 1 Vp-p	IC101 Pin 21		REC, EE 2 Vp-p
IC101 Pin 7		REC, EE 1 Vp-p	IC101 (UPPER) Pin 21 (LOWER) Pin 20		STILL (UPPER) 2 Vp-p (LOWER) 5 Vp-p
IC101 Pin 6		REC, EE 0.45 Vp-p	IC111 Pin 21		REC, EE 1 Vp-p
IC101 Pin 2		REC, EE 1.3 Vp-p	IC111 Pin 3		REC, EE 0.14 Vp-p
IC101 Pin 30		REC, EE 1.5 Vp-p	IC111 Pin 9		REC, EE 0.8Vp-p
IC101 Pin 26		PB 0.3 Vp-p	Q1105 Base		PB 0.1 Vp-p
IC101 Pin 7		PB 2.0 Vp-p	Q1106 Emitter		PB 0.8 Vp-p
Q1002 Base		PB 0.5 Vp-p	IC111 Pin 7		PB 0.3 Vp-p
IC101 Pin 9		PB 0.6 Vp-p	IC111 Pin 5		PB 1.2 Vp-p
IC101 Pins 10/12		PB 0.5 Vp-p	IC111 Pin 24		PB 0.24 Vp-p
IC101 Pin 21		PB 2 Vp-p	IC111 Pin 23		PB 0.7 Vp-p

CP-1 BOARD (CV-A) RF CONVERTER CONNECTION CIRCUIT DIAGRAM

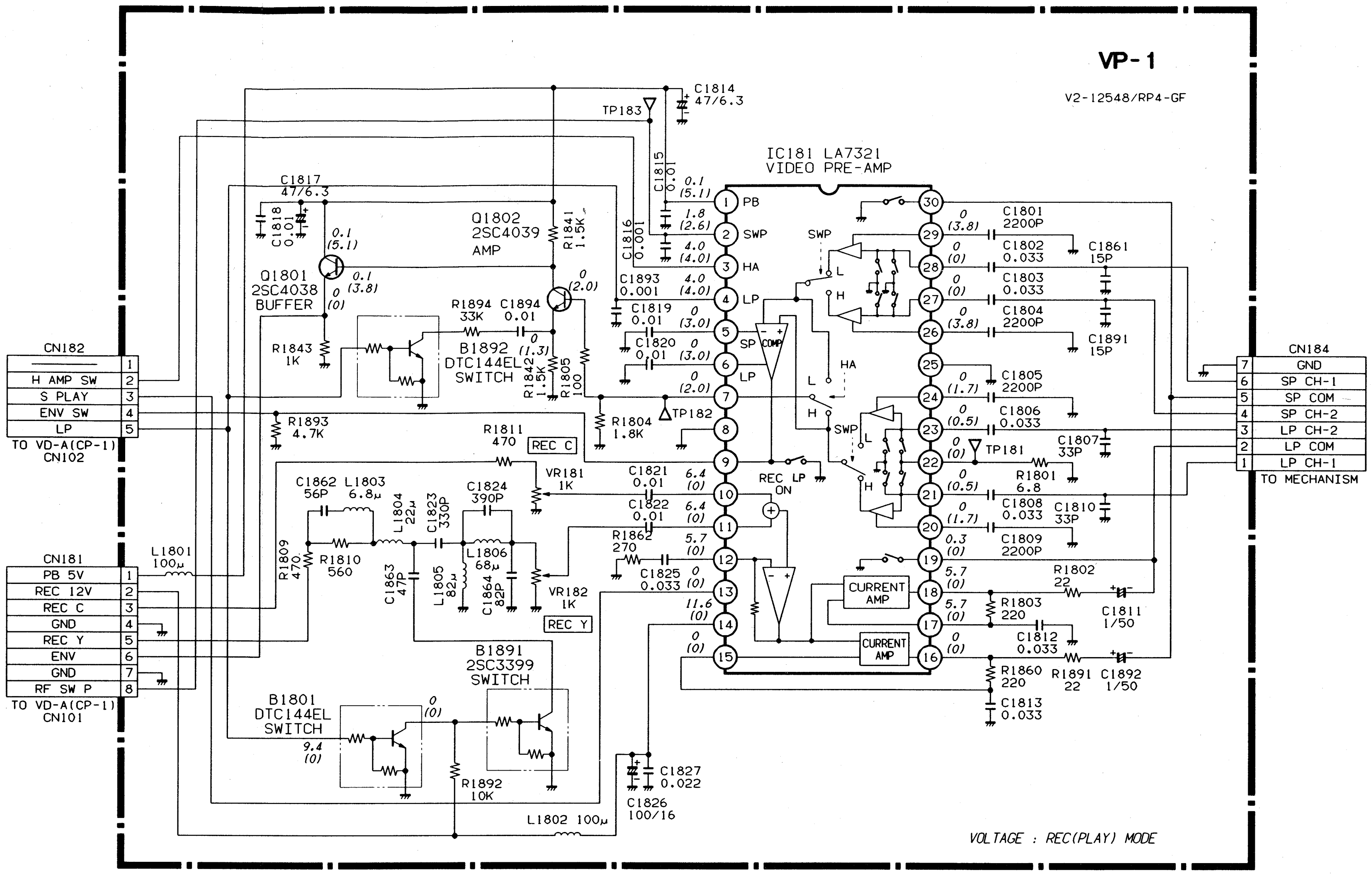

ANT IN
(RF IN)
TO TN-A
TO AD-A
TO PW-A
VD(CV TNA)
AD(CV)
SWD 5V
ALWAYS 5V
L6601
15μH
C6601
100/6.3
L6602
15μH
2
3
4
5
6
VIDEO IN
AUDIO IN
MOD.(SWD 5V)
GND
BST.(ALWAYS 5V)
RF OUT
TO TV.
CV- A
R1-12511/RP3-EX
RF CONV.
RF OUT
TO TUNER

VP-

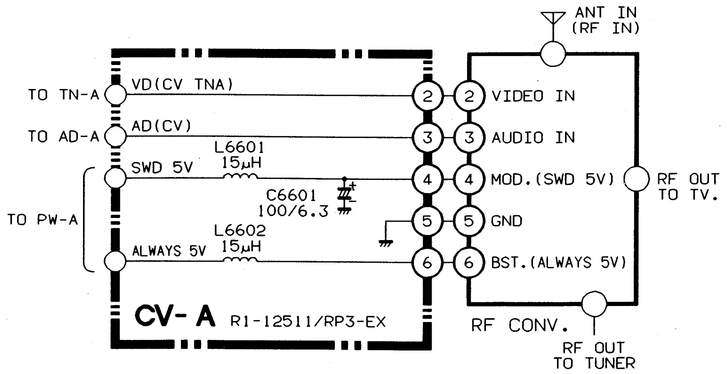

C1817
47/6.3
C1818
0.01
0.1
(5.1)
Q1801
2SC4038
BUFFER
0
(0)
0.1
(3.8
R1843
1K
CN182
1
H AMP SW 2
S PLAY 3
ENV SW 4
LP 5
TO VD-A(CP-1)
CN102
R1893
4.7K
C1862
56P
L180
6.8
CN181
PB 5V 1
REC 12V 2
REC C 3
GND 4
REC Y 5
ENV 6
GND 7
RF SW P 8
TO VD-A(CP-1)
CN101
L1801
100μ
R1809
470
R1810
560
B1801
DTC144EL
SWITCH
9.4
(0)

/LEVEL
E
R) R)
E
E -p
E p
p
p
p
p
-p
p

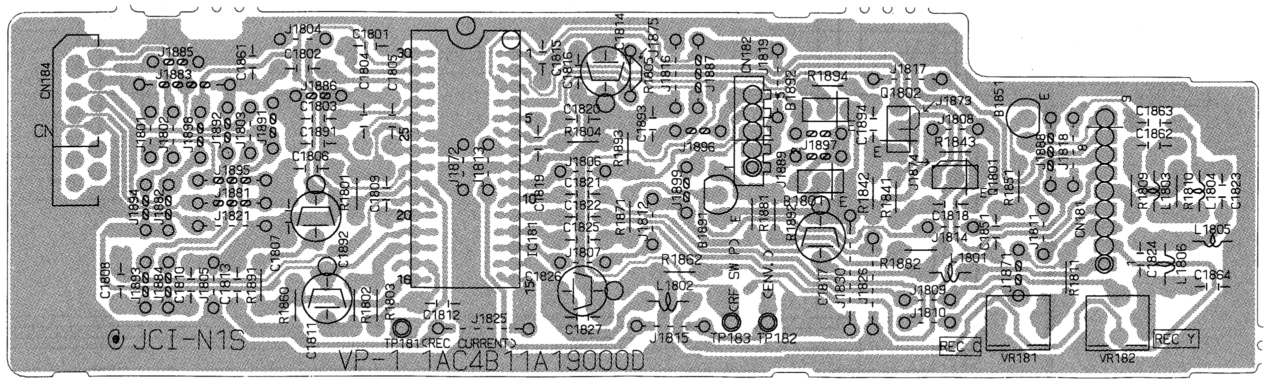
VP-1 BOARD VIDEO PRE-AMP CIRCUIT DIAGRAM


VP-1
V2-12548/RP4-GF
IC181 LA7321
VIDEO PRE-AMP
Q1801
2SC4038
BUFFER
Q1802
2SC4039
AMP
B1892
DTC144EL
SWITCH
B1891
2SC3399
SWITCH
B1801
DTC144EL
SWITCH
C1814 47/6.3
TP183
C1815 0.01
C1816 0.001
C1817 47/6.3
C1818 0.01
R1841 1.5K
R1842 1.5K
R1805 100
R1843 1K
R1893 4.7K
R1894 33K
C1894 0.01
C1893 0.001
C1819 0.01
C1820 0.01
R1804 1.8K
TP182
R1811 470
REC C
VR181 1K
C1821 0.01
C1822 0.01
C1862 56P
L1803 6.8μ
L1804 22μ
C1823 330P
C1824 390P
R1809 470
R1810 560
C1863 47P
L1805 82μ
L1806 68μ
C1864 82P
VR182 1K
REC Y
R1862 270
C1825 0.033
R1892 10K
L1801 100μ
L1802 100μ
C1827 0.022
C1826 100/16
PB
SWP
HA
LP
SP
COMP
REC LP ON
CURRENT AMP
C1801 2200P
C1802 0.033
C1803 0.033
C1804 2200P
C1805 2200P
C1806 0.033
C1807 33P
TP181
R1801 6.8
C1808 0.033
C1810 33P
C1809 2200P
R1802 22
C1811 1/50
R1803 220
C1812 0.033
R1860 220
R1891 22
C1892 1/50
C1813 0.033
C1861 15P
C1891 15P
CN182
H AMP SW
S PLAY
ENV SW
LP
TO VD-A(CP-1)
CN102
CN181
PB 5V
REC 12V
REC C
GND
REC Y
ENV
GND
RF SW P
TO VD-A(CP-1)
CN101
CN184
GND
SP CH-1
SP COM
SP CH-2
LP CH-2
LP COM
LP CH-1
TO MECHANISM
VOLTAGE : REC(PLAY) MODE

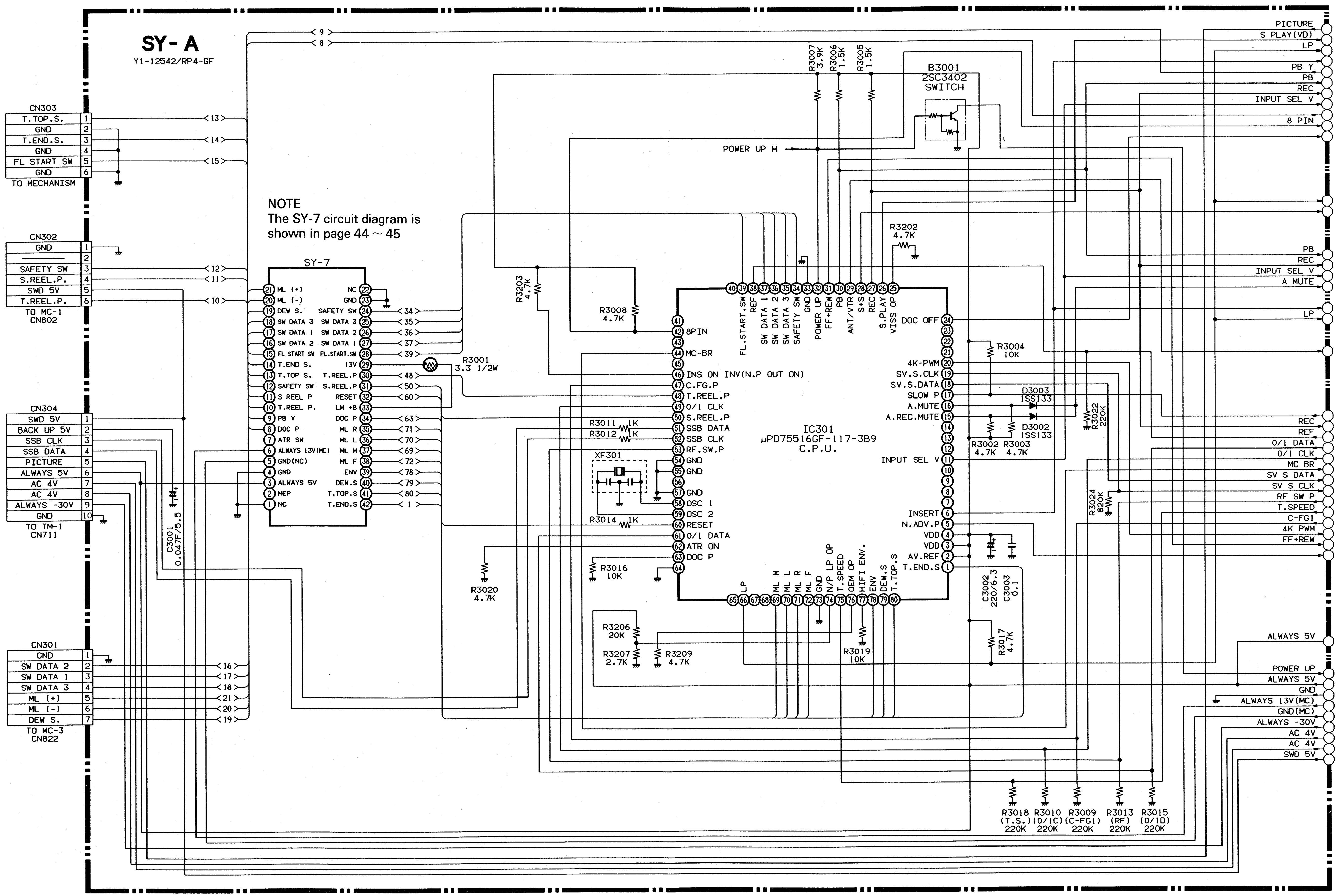
CP-1 BOARD (CV-A) RF CONVERTER CONNECTION CIRCUIT DIAGRAM


ANT IN
(RF IN)
TO TN-A
VD(CV TNA)
TO AD-A
AD(CV)
TO PW-A
SWD 5V
L6601 15μH
C6601 100/6.3
ALWAYS 5V
L6602 15μH
VIDEO IN
AUDIO IN
MOD.(SWD 5V)
GND
BST.(ALWAYS 5V)
RF OUT
TO TV.
CV-A
R1-12511/RP3-EX
RF CONV.
RF OUT
TO TUNER

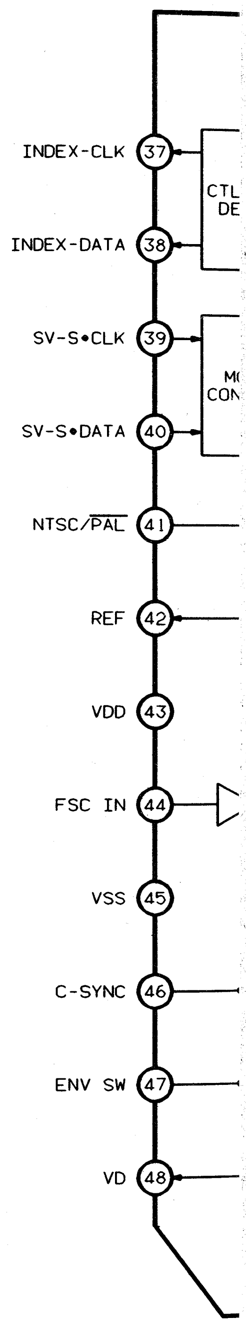
VP-1 P.C.B.


CN184
CN181
CN182
IC181
REC C
REC Y
VR181
VR182
TP181
TP182
TP183
JCI-N1S
VP-1 1AC4B11A19000D

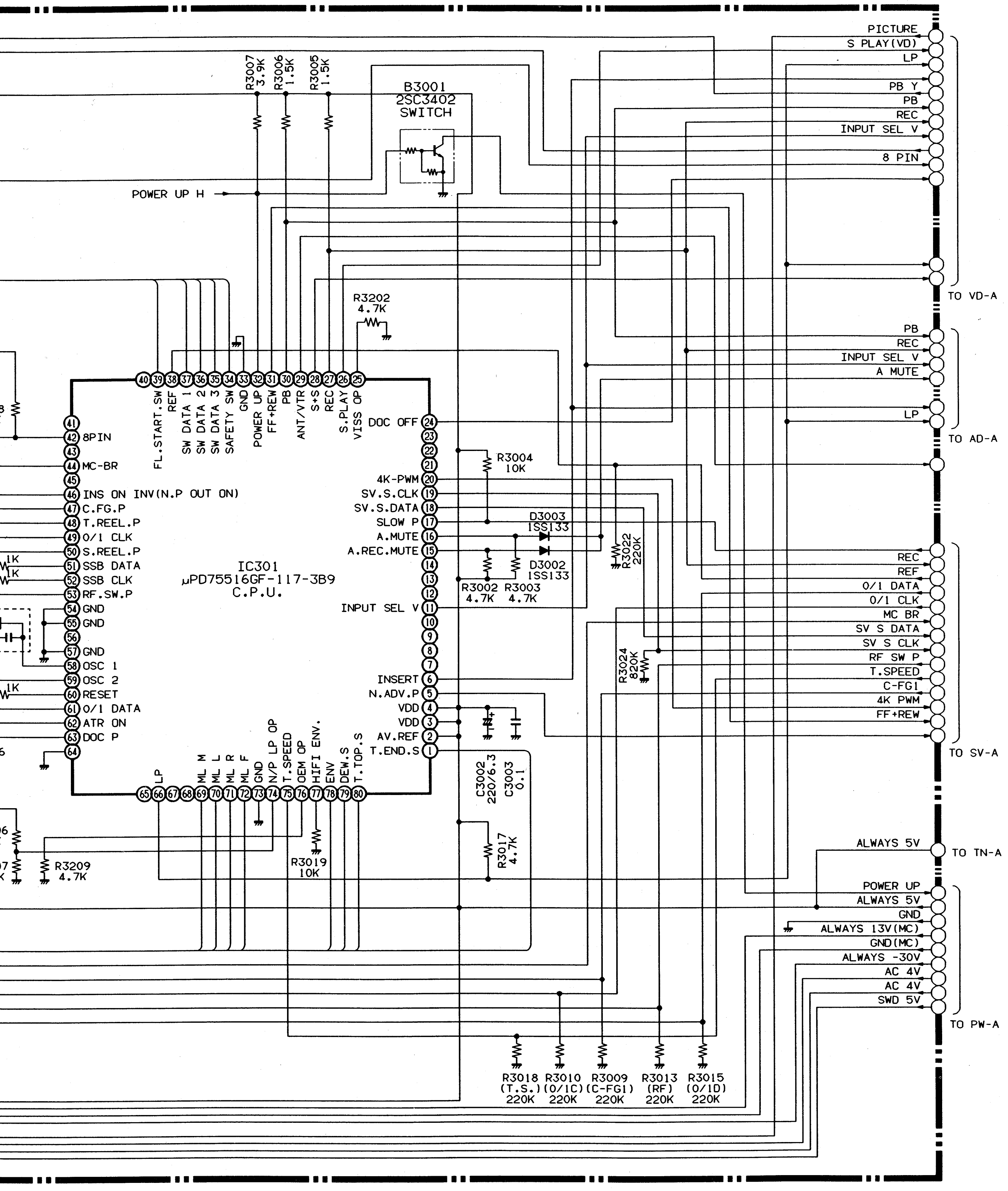
CP-1 BOARD (SY-A) SYSTEM CONTROL CIRCUIT DIAGRAM


SY- A
Y1-12542/RP4-GF
CN303
T.TOP.S. 1
GND 2
T.END.S. 3
GND 4
FL START SW 5
GND 6
TO MECHANISM
CN302
GND 1
2
SAFETY SW 3
S.REEL.P. 4
SWD 5V 5
T.REEL.P. 6
TO MC-1 CN802
CN304
SWD 5V 1
BACK UP 5V 2
SSB CLK 3
SSB DATA 4
PICTURE 5
ALWAYS 5V 6
AC 4V 7
AC 4V 8
ALWAYS -30V 9
GND 10
TO TM-1 CN711
CN301
GND 1
SW DATA 2 2
SW DATA 1 3
SW DATA 3 4
ML (+) 5
ML (-) 6
DEW S. 7
TO MC-3 CN822
SY-7
21 ML (+)
20 ML (-)
19 DEW S.
18 SW DATA 3
17 SW DATA 1
16 SW DATA 2
15 FL START SW
14 T.END S.
13 T.TOP S.
12 SAFETY SW
11 S REEL P
10 T.REEL P.
9 PB Y
8 DOC P
7 ATR SW
6 ALWAYS 13V(MC)
5 GND(MC)
4 GND
3 ALWAYS 5V
2 MEP
1 NC
NC 22
GND 23
SAFETY SW 24
SW DATA 3 25
SW DATA 2 26
SW DATA 1 27
FL.START.SW 28
13V 29
T.REEL.P 30
S.REEL.P 31
RESET 32
LM +B 33
DOC P 34
ML R 35
ML L 36
ML M 37
ML F 38
ENV 39
DEW.S 40
T.TOP.S 41
T.END.S 42
R3001 3.3 1/2W
C3001 0.047F/5.5
R3203 4.7K
R3008 4.7K
R3007 3.9K
R3006 1.5K
R3005 1.5K
B3001 2SC3402 SWITCH
POWER UP H
R3202 4.7K
IC301 μPD75516GF-117-3B9 C.P.U.
40 FL.START.SW
39 REF
38 SW DATA 1
37 SW DATA 2
36 SW DATA 3
35 SAFETY SW
34 GND
33 POWER UP
32 FF+REW
31 PB
30 ANT/VTR
29 S+S
28 REC
27 S.PLAY
26 VISS OP
25
DOC OFF 24
23
22
21
4K-PWM 20
SV.S.CLK 19
SV.S.DATA 18
SLOW P 17
A.MUTE 16
A.REC.MUTE 15
14
13
12
INPUT SEL V 11
10
9
8
7
INSERT 6
N.ADV.P 5
VDD 4
VDD 3
AV.REF 2
T.END.S 1
41
42 8PIN
43
44 MC-BR
45
46 INS ON INV(N.P OUT ON)
47 C.FG.P
48 T.REEL.P
49 0/1 CLK
50 S.REEL.P
51 SSB DATA
52 SSB CLK
53 RF.SW.P
54 GND
55 GND
56
57 GND
58 OSC 1
59 OSC 2
60 RESET
61 0/1 DATA
62 ATR ON
63 DOC P
64
65 LP
ML M
ML L
ML R
ML F
GND
N/P LP OP
T.SPEED
OEM OP
HIFI ENV.
ENV
DEW.S
T.TOP.S
80
R3004 10K
D3003 1SS133
D3002 1SS133
R3002 4.7K
R3003 4.7K
R3022 220K
R3024 820K
R3011 1K
R3012 1K
XF301
R3014 1K
R3016 10K
R3020 4.7K
C3002 220/6.3
C3003 0.1
R3017 4.7K
R3019 10K
R3206 20K
R3207 2.7K
R3209 4.7K
R3018 (T.S.) 220K
R3010 (0/1C) 220K
R3009 (C-FG1) 220K
R3013 (RF) 220K
R3015 (0/1D) 220K
PICTURE
S PLAY(VD)
LP
PB Y
PB
REC
INPUT SEL V
8 PIN
TO VD-A
PB
REC
INPUT SEL V
A MUTE
LP
TO AD-A
REC
REF
0/1 DATA
0/1 CLK
MC BR
SV S DATA
SV S CLK
RF SW P
T.SPEED
C-FG1
4K PWM
FF+REW
TO SV-A
ALWAYS 5V
TO TN-A
POWER UP
ALWAYS 5V
GND
ALWAYS 13V(MC)
GND(MC)
ALWAYS -30V
AC 4V
AC 4V
SWD 5V
TO PW-A
K J I H G F E D C B A
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17

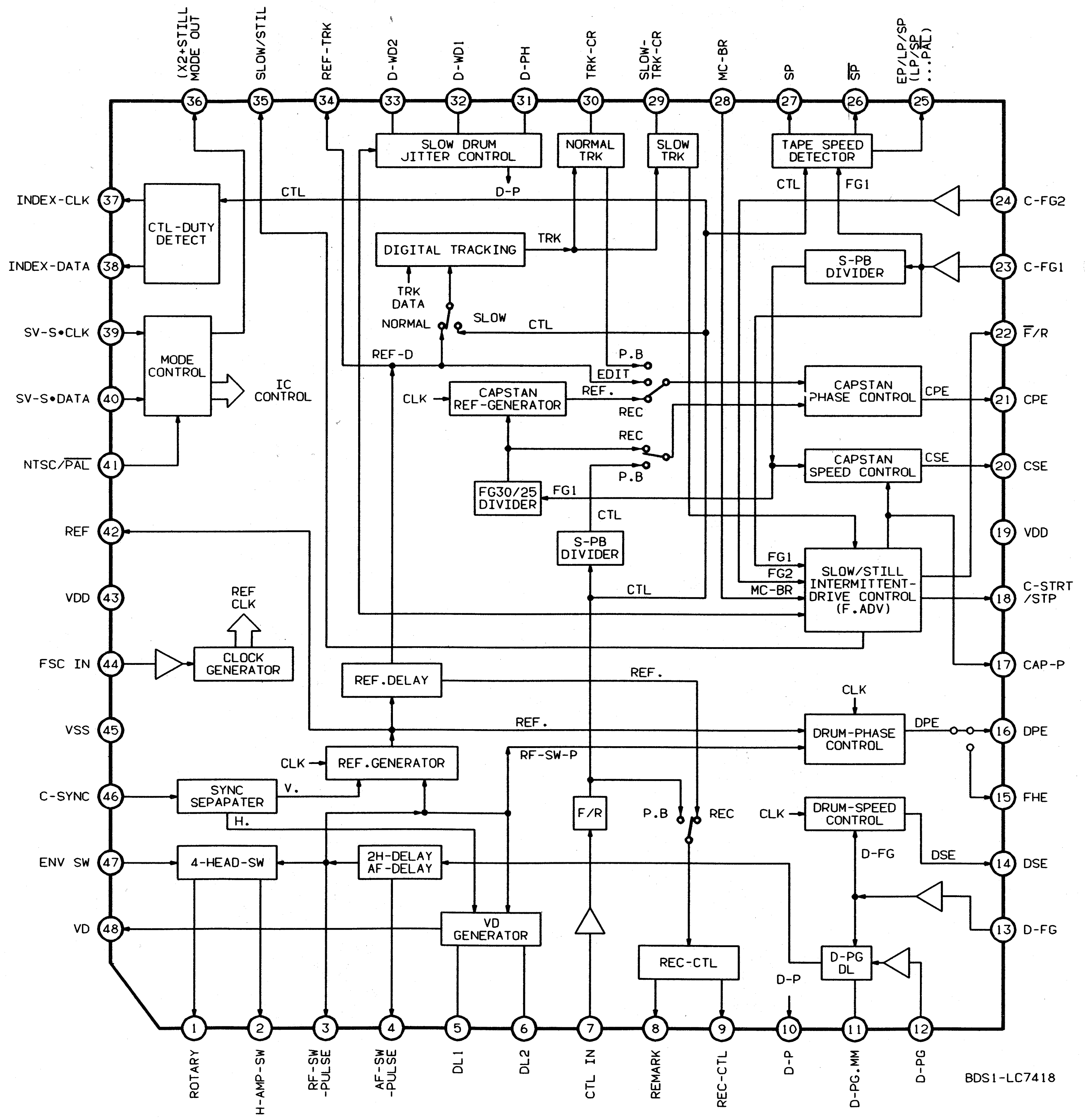
NOTE
The SY-7 circuit diagram is shown in page 44 ~ 45


INDEX-CLK 37
INDEX-DATA 38
SV-S•CLK 39
SV-S•DATA 40
NTSC/PAL 41
REF 42
VDD 43
FSC IN 44
VSS 45
C-SYNC 46
ENV SW 47
VD 48
CTL DE
MC CON

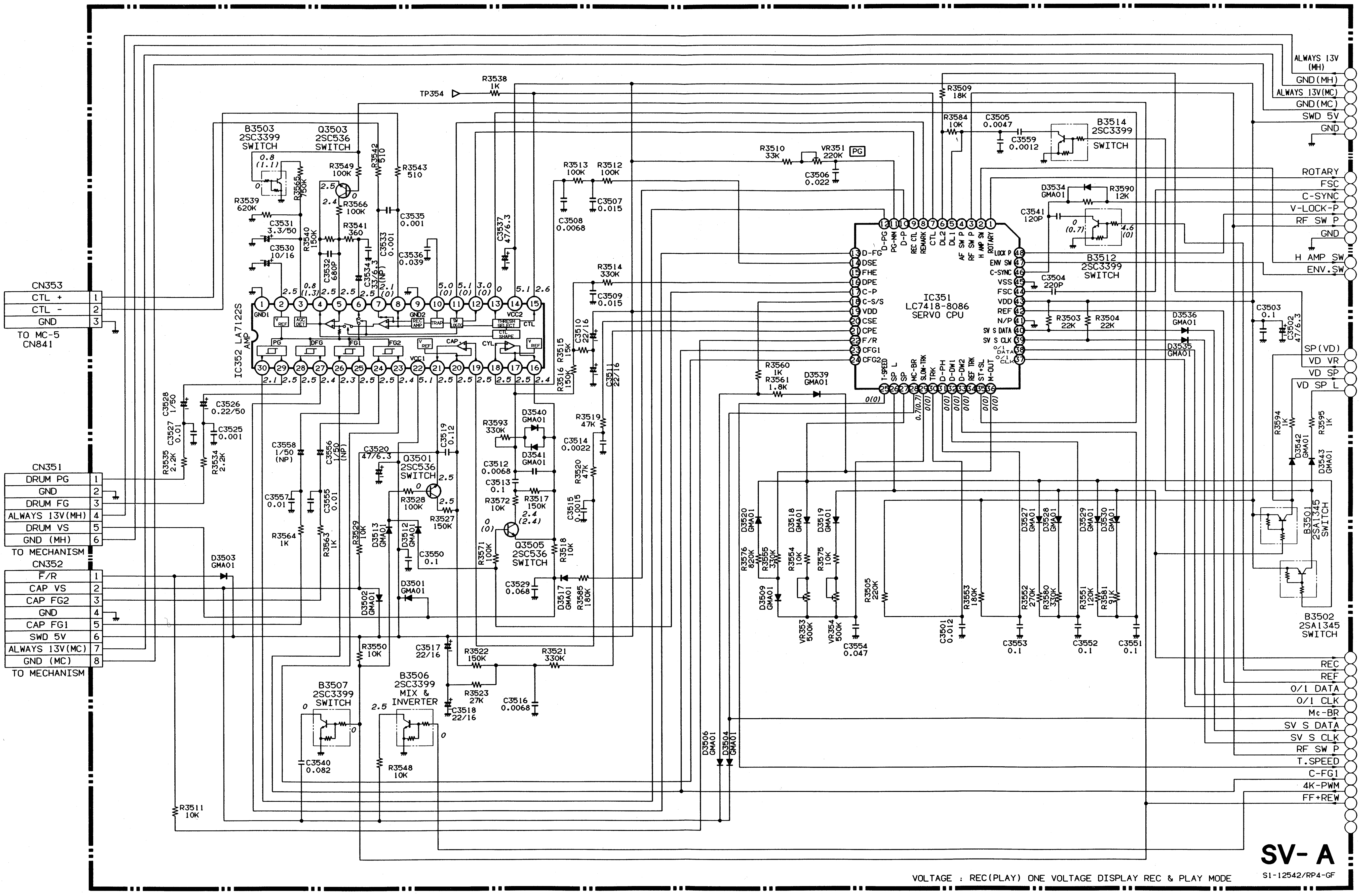
STEM CONTROL CIRCUIT DIAGRAM


PICTURE
S PLAY(VD)
LP
PB Y
PB
REC
INPUT SEL V
8 PIN
R3007 3.9K
R3006 1.5K
R3005 1.5K
B3001 2SC3402 SWITCH
POWER UP H
TO VD-A
R3202 4.7K
PB
REC
INPUT SEL V
A MUTE
LP
TO AD-A
IC301 μPD75516GF-117-3B9 C.P.U.
FL.START.SW
REF
SW DATA 1
SW DATA 2
SW DATA 3
SAFETY SW
GND
POWER UP
FF+REW
PB
ANT/VTR
S+S
REC
S.PLAY
VISS OP
DOC OFF
8PIN
MC-BR
INS ON INV(N.P OUT ON)
C.FG.P
T.REEL.P
0/1 CLK
S.REEL.P
SSB DATA
SSB CLK
RF.SW.P
GND
GND
GND
OSC 1
OSC 2
RESET
0/1 DATA
ATR ON
DOC P
4K-PWM
SV.S.CLK
SV.S.DATA
SLOW P
A.MUTE
A.REC.MUTE
INPUT SEL V
INSERT
N.ADV.P
VDD
VDD
AV.REF
T.END.S
LP
ML M
ML L
ML R
ML F
GND
N/P LP OP
T.SPEED
OEM OP
HIFI ENV.
ENV
DEW.S
T.TOP.S
R3004 10K
D3003 1SS133
D3002 1SS133
R3002 4.7K
R3003 4.7K
R3022 220K
R3024 820K
C3002 220/6.3
C3003 0.1
R3017 4.7K
R3019 10K
R3209 4.7K
REC
REF
0/1 DATA
0/1 CLK
MC BR
SV S DATA
SV S CLK
RF SW P
T.SPEED
C-FG1
4K PWM
FF+REW
TO SV-A
ALWAYS 5V
TO TN-A
POWER UP
ALWAYS 5V
GND
ALWAYS 13V(MC)
GND(MC)
ALWAYS -30V
AC 4V
AC 4V
SWD 5V
TO PW-A
R3018 (T.S.) 220K
R3010 (0/1C) 220K
R3009 (C-FG1) 220K
R3013 (RF) 220K
R3015 (0/1D) 220K

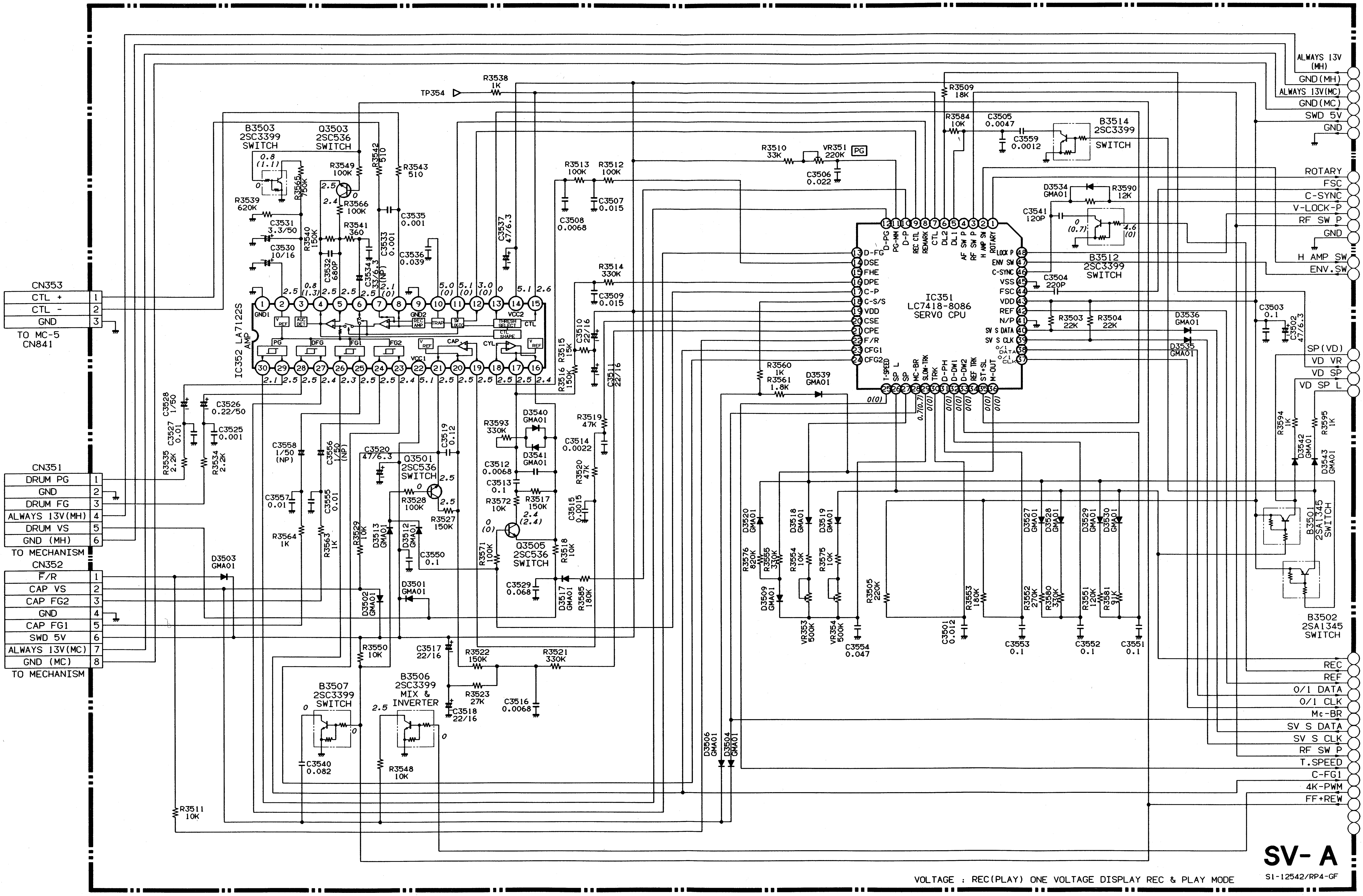
IC351 (LC7418) DIGITAL SERVO IC INTER BLOCK DIAGRAM


(X2+STILL MODE OUT
SLOW/STIL
REF-TRK
D-WD2
D-WD1
D-PH
TRK-CR
SLOW-TRK-CR
MC-BR
SP
SP
EP/LP/SP (LP/SP ...PAL)
INDEX-CLK
INDEX-DATA
SV-S•CLK
SV-S•DATA
NTSC/PAL
REF
VDD
FSC IN
VSS
C-SYNC
ENV SW
VD
C-FG2
C-FG1
F/R
CPE
CSE
VDD
C-STRT /STP
CAP-P
DPE
FHE
DSE
D-FG
ROTARY
H-AMP-SW
RF-SW -PULSE
AF-SW -PULSE
DL1
DL2
CTL IN
REMARK
REC-CTL
D-P
D-PG.MM
D-PG
SLOW DRUM JITTER CONTROL
NORMAL TRK
SLOW TRK
TAPE SPEED DETECTOR
CTL-DUTY DETECT
DIGITAL TRACKING
S-PB DIVIDER
MODE CONTROL
IC CONTROL
CAPSTAN REF-GENERATOR
CAPSTAN PHASE CONTROL
CAPSTAN SPEED CONTROL
FG30/25 DIVIDER
S-PB DIVIDER
SLOW/STILL INTERMITTENT-DRIVE CONTROL (F.ADV)
REF CLK
CLOCK GENERATOR
REF.DELAY
REF.GENERATOR
DRUM-PHASE CONTROL
SYNC SEPAPATER
F/R
DRUM-SPEED CONTROL
4-HEAD-SW
2H-DELAY AF-DELAY
VD GENERATOR
REC-CTL
D-PG DL
CTL
D-P
CTL
FG1
TRK
TRK DATA
NORMAL
SLOW
CTL
REF-D
P.B
EDIT
REF.
REC
REC
P.B
CLK
FG1
CTL
CTL
FG1
FG2
MC-BR
CPE
CSE
REF.
CLK
REF.
DPE
RF-SW-P
CLK
V.
H.
P.B
REC
CLK
D-FG
DSE
D-P
BDS1-LC7418

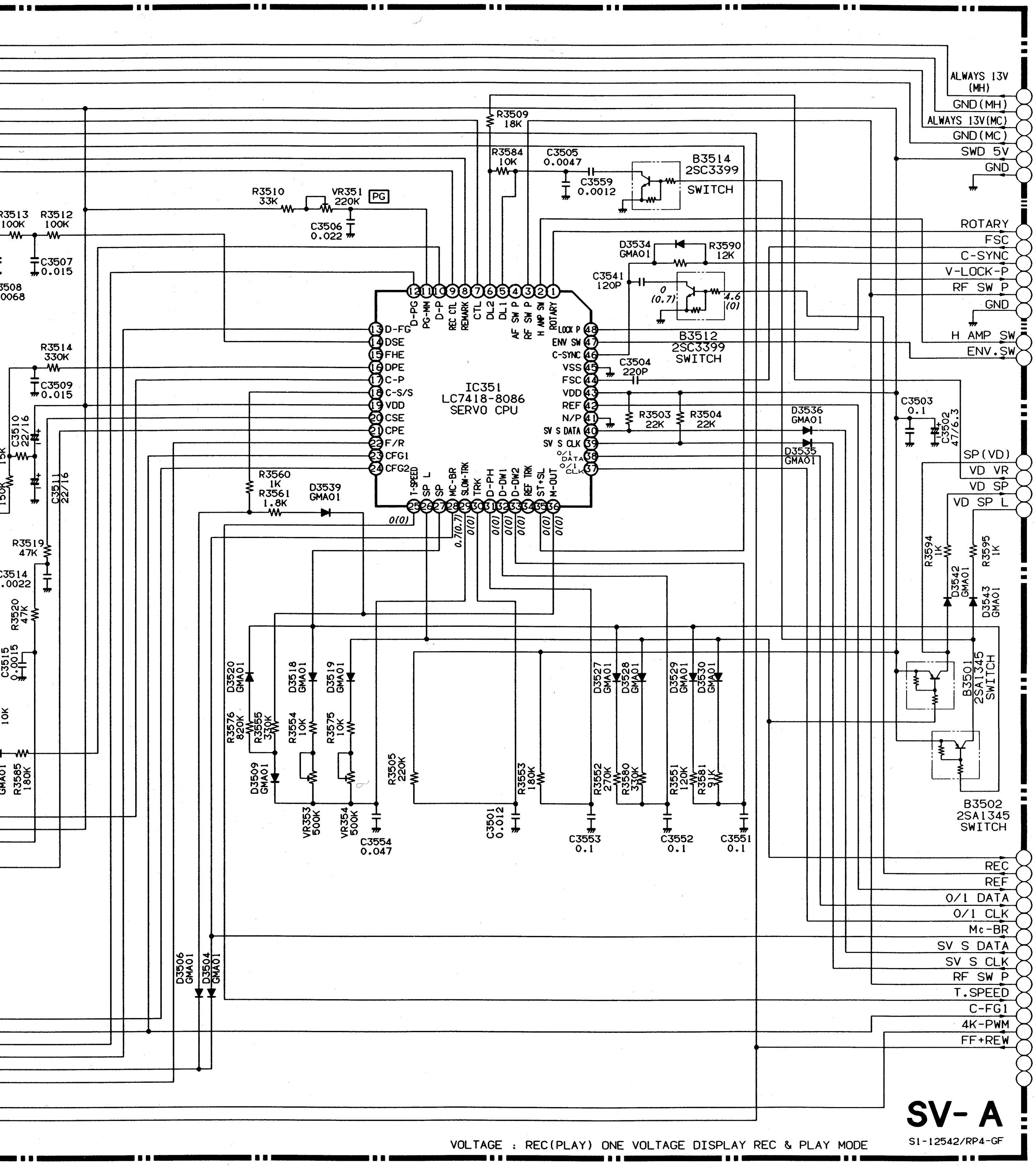
CP-1 BOARD (SV-A) SERVO CIRCUIT DIAGRAM


CN353
CTL +
CTL -
GND
TO MC-5 CN841
CN351
DRUM PG
GND
DRUM FG
ALWAYS 13V(MH)
DRUM VS
GND (MH)
TO MECHANISM
CN352
F/R
CAP VS
CAP FG2
GND
CAP FG1
SWD 5V
ALWAYS 13V(MC)
GND (MC)
TO MECHANISM
IC352 LA7122S AMP
IC351 LC7418-8086 SERVO CPU
B3503 2SC3399 SWITCH
Q3503 2SC536 SWITCH
Q3501 2SC536 SWITCH
Q3505 2SC536 SWITCH
B3507 2SC3399 SWITCH
B3506 2SC3399 MIX & INVERTER
B3514 2SC3399 SWITCH
B3512 2SC3399 SWITCH
B3501 2SA1345 SWITCH
B3502 2SA1345 SWITCH
TP354
VR351 220K
PG
VR353 500K
VR354 500K
ALWAYS 13V (MH)
GND(MH)
ALWAYS 13V(MC)
GND(MC)
SWD 5V
GND
TO PW-A
ROTARY
FSC
C-SYNC
V-LOCK-P
RF SW P
GND
H AMP SW
ENV.SW
SP(VD)
VD VR
VD SP
VD SP L
TO VD-A
REC
REF
0/1 DATA
0/1 CLK
Mc-BR
SV S DATA
SV S CLK
RF SW P
T.SPEED
C-FG1
4K-PWM
FF+REW
TO SY-A
SV-A
VOLTAGE : REC(PLAY) ONE VOLTAGE DISPLAY REC & PLAY MODE
S1-12542/RP4-GF

CP-1 BOARD (SV-A) SERVO CIRCUIT DIAGRAM

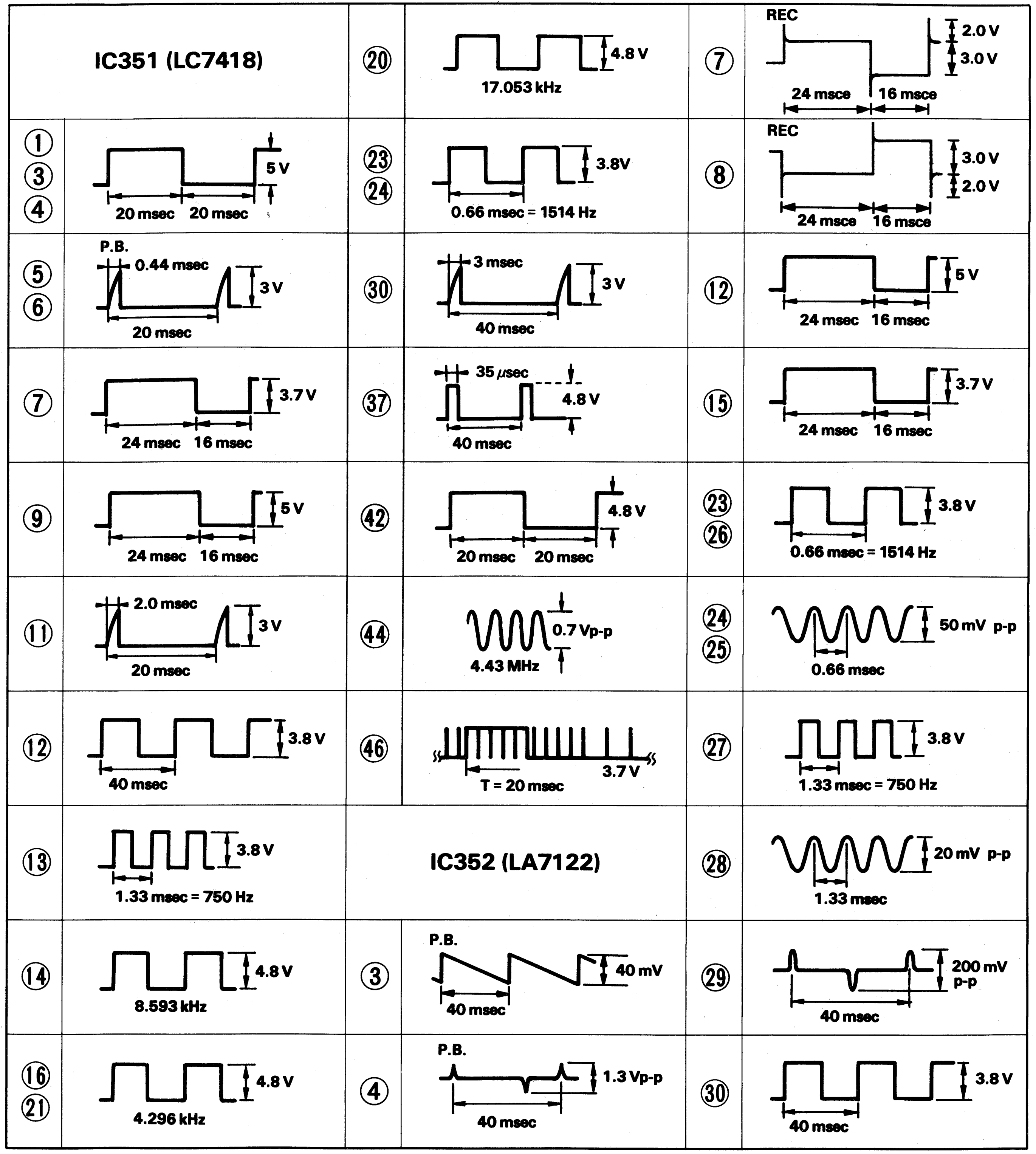

CN353
CTL +
CTL -
GND
TO MC-5 CN841
CN351
DRUM PG
GND
DRUM FG
ALWAYS 13V(MH)
DRUM VS
GND (MH)
TO MECHANISM
CN352
F/R
CAP VS
CAP FG2
GND
CAP FG1
SWD 5V
ALWAYS 13V(MC)
GND (MC)
TO MECHANISM
IC352 LA7122S AMP
IC351 LC7418-8086 SERVO CPU
B3503 2SC3399 SWITCH
Q3503 2SC536 SWITCH
Q3501 2SC536 SWITCH
Q3505 2SC536 SWITCH
B3507 2SC3399 SWITCH
B3506 2SC3399 MIX & INVERTER
B3514 2SC3399 SWITCH
B3512 2SC3399 SWITCH
B3501 2SA1345 SWITCH
B3502 2SA1345 SWITCH
TP354
VR351 220K
PG
VR353 500K
VR354 500K
ALWAYS 13V (MH)
GND(MH)
ALWAYS 13V(MC)
GND(MC)
SWD 5V
GND
TO PW-A
ROTARY
FSC
C-SYNC
V-LOCK-P
RF SW P
GND
H AMP SW
ENV.SW
SP(VD)
VD VR
VD SP
VD SP L
TO VD-A
REC
REF
0/1 DATA
0/1 CLK
Mc-BR
SV S DATA
SV S CLK
RF SW P
T.SPEED
C-FG1
4K-PWM
FF+REW
TO SY-A
SV- A
VOLTAGE : REC(PLAY) ONE VOLTAGE DISPLAY REC & PLAY MODE
S1-12542/RP4-GF

RD (SV-A) SERVO CIRCUIT DIAGRAM


IC351
LC7418-8086
SERVO CPU
ALWAYS 13V (MH)
GND(MH)
ALWAYS 13V(MC)
GND(MC)
SWD 5V
GND
TO PW-A
ROTARY
FSC
C-SYNC
V-LOCK-P
RF SW P
GND
H AMP SW
ENV.SW
TO VD-A
SP(VD)
VD VR
VD SP
VD SP L
REC
REF
0/1 DATA
0/1 CLK
Mc-BR
SV S DATA
SV S CLK
RF SW P
T.SPEED
C-FG1
4K-PWM
FF+REW
TO SY-A
R3509 18K
R3584 10K
C3505 0.0047
C3559 0.0012
B3514 2SC3399 SWITCH
R3510 33K
VR351 220K
PG
C3506 0.022
R3513 100K
R3512 100K
C3507 0.015
R3514 330K
C3509 0.015
D3534 GMA01
R3590 12K
C3541 120P
B3512 2SC3399 SWITCH
C3504 220P
R3503 22K
R3504 22K
D3536 GMA01
D3535 GMA01
C3503 0.1
C3502 47/6.3
R3560 1K
R3561 1.8K
D3539 GMA01
R3519 47K
C3514 .0022
R3520 47K
C3515 0.0015
R3585 180K
R3594 1K
R3595 1K
D3542 GMA01
D3543 GMA01
B3501 2SA1345 SWITCH
B3502 2SA1345 SWITCH
D3520 GMA01
D3518 GMA01
D3519 GMA01
R3576 820K
R3555 330K
R3554 10K
R3575 10K
D3509 GMA01
VR353 500K
VR354 500K
C3554 0.047
R3505 220K
R3553 180K
C3501 0.012
D3527 GMA01
D3528 GMA01
D3529 GMA01
D3530 GMA01
R3552 270K
R3580 330K
R3551 120K
R3581 91K
C3553 0.1
C3552 0.1
C3551 0.1
D3506 GMA01
D3504 GMA01
SV- A
S1-12542/RP4-GF

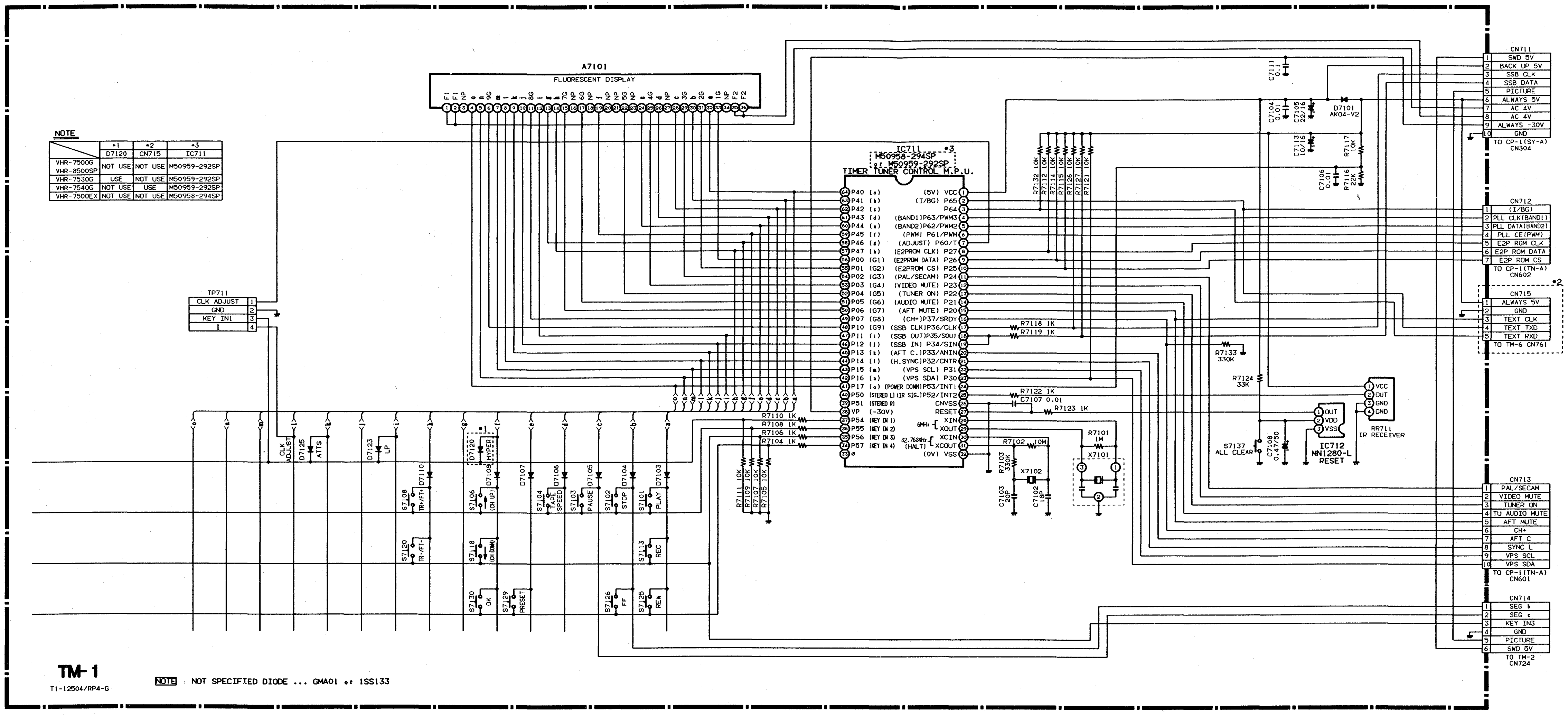
VOLTAGE : REC(PLAY) ONE VOLTAGE DISPLAY REC & PLAY MODE

WAVEFORM OF SERVO


IC351 (LC7418)
① ③ ④ 5V 20 msec 20 msec
⑤ ⑥ P.B. 0.44 msec 3V 20 msec
⑦ 3.7V 24 msec 16 msec
⑨ 5V 24 msec 16 msec
⑪ 2.0 msec 3V 20 msec
⑫ 3.8V 40 msec
⑬ 3.8V 1.33 msec = 750 Hz
⑭ 4.8V 8.593 kHz
⑯ ㉑ 4.8V 4.296 kHz
⑳ 4.8V 17.053 kHz
㉓ ㉔ 3.8V 0.66 msec = 1514 Hz
㉚ 3 msec 3V 40 msec
㊲ 35 μsec 4.8V 40 msec
㊷ 4.8V 20 msec 20 msec
㊹ 0.7 Vp-p 4.43 MHz
㊻ 3.7V T = 20 msec
IC352 (LA7122)
③ P.B. 40 mV 40 msec
④ P.B. 1.3 Vp-p 40 msec
⑦ REC 2.0V 3.0V 24 msce 16 msce
⑧ REC 3.0V 2.0V 24 msce 16 msce
⑫ 5V 24 msec 16 msec
⑮ 3.7V 24 msec 16 msec
㉓ ㉖ 3.8V 0.66 msec = 1514 Hz
㉔ ㉕ 50 mV p-p 0.66 msec
㉗ 3.8V 1.33 msec = 750 Hz
㉘ 20 mV p-p 1.33 msec
㉙ 200 mV p-p 40 msec
㉚ 3.8V 40 msec

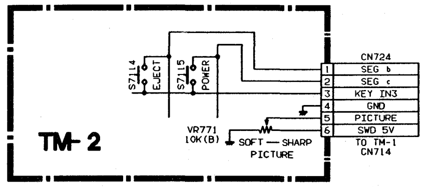
WF-S3

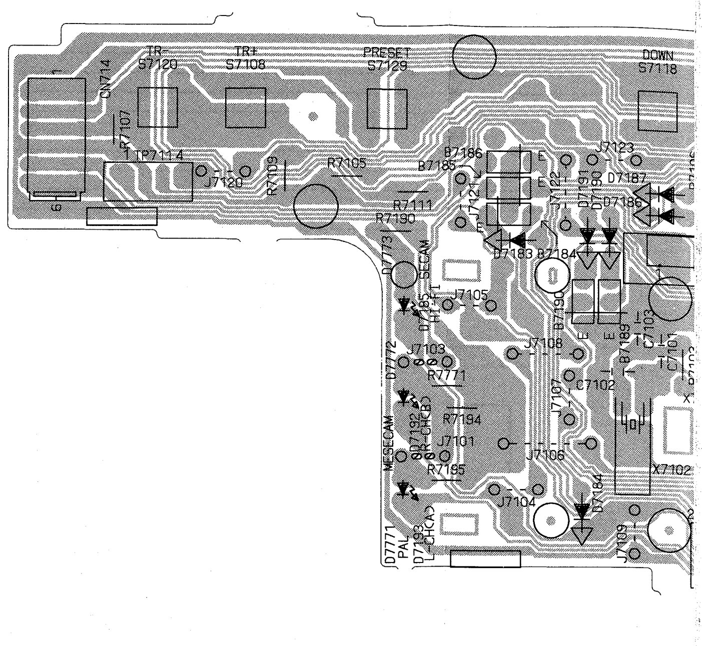
TM-1 BOARD DISPLAY, TIMER & TUNING CONTROL CIRCUIT DIAGRAM

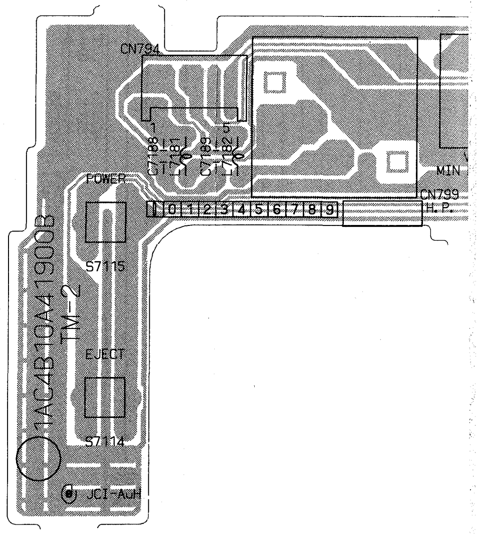

A7101
FLUORESCENT DISPLAY
IC711 *3
M50958-294SP
or M50959-292SP
TIMER TUNER CONTROL M.P.U.
P40 (a)
P41 (b)
P42 (c)
P43 (d)
P44 (e)
P45 (f)
P46 (g)
P47 (h)
P00 (G1)
P01 (G2)
P02 (G3)
P03 (G4)
P04 (G5)
P05 (G6)
P06 (G7)
P07 (G8)
P10 (G9)
P11 (i)
P12 (j)
P13 (k)
P14 (l)
P15 (m)
P16 (n)
P17 (o)
P50 (STEREO L)
P51 (STEREO R)
VP (-30V)
P54 (KEY IN 1)
P55 (KEY IN 2)
P56 (KEY IN 3)
P57 (KEY IN 4)
ø
(5V) VCC
(I/BG) P65
P64
(BAND1)P63/PWM3
(BAND2)P62/PWM2
(PWM) P61/PWM
(ADJUST) P60/T
(E2PROM CLK) P27
(E2PROM DATA) P26
(E2PROM CS) P25
(PAL/SECAM) P24
(VIDEO MUTE) P23
(TUNER ON) P22
(AUDIO MUTE) P21
(AFT MUTE) P20
(CH+)P37/SRDY
(SSB CLK)P36/CLK
(SSB OUT)P35/SOUT
(SSB IN) P34/SIN
(AFT C.)P33/ANIN
(H.SYNC)P32/CNTR
(VPS SCL) P31
(VPS SDA) P30
(POWER DOWN)P53/INT1
(IR SIG.)P52/INT2
CNVSS
RESET
6MHz XIN XOUT
32.768KHz (HALT) XCIN XCOUT
(0V) VSS
TP711
CLK ADJUST
GND
KEY IN1
IC712 MN1280-L RESET
RR711 IR RECEIVER
VCC OUT GND GND
S7137 ALL CLEAR
X7101
X7102
D7101 AK04-V2
CN711
SWD 5V
BACK UP 5V
SSB CLK
SSB DATA
PICTURE
ALWAYS 5V
AC 4V
AC 4V
ALWAYS -30V
GND
TO CP-1(SY-A) CN304
CN712
(I/BG)
PLL CLK(BAND1)
PLL DATA(BAND2)
PLL CE(PWM)
E2P ROM CLK
E2P ROM DATA
E2P ROM CS
TO CP-1(TN-A) CN602
*2
CN715
ALWAYS 5V
GND
TEXT CLK
TEXT TXD
TEXT RXD
TO TM-6 CN761
CN713
PAL/SECAM
VIDEO MUTE
TUNER ON
TU AUDIO MUTE
AFT MUTE
CH+
AFT C
SYNC L
VPS SCL
VPS SDA
TO CP-1(TN-A) CN601
CN714
SEG b
SEG c
KEY IN3
GND
PICTURE
SWD 5V
TO TM-2 CN724
TM-1
T1-12504/RP4-G
NOTE : NOT SPECIFIED DIODE ... GMA01 or 1SS133

NOTE

	*1	*2	*3
	D7120	CN715	IC711
VHR-7500G VHR-8500SP	NOT USE	NOT USE	M50959-292SP
VHR-7530G	USE	NOT USE	M50959-292SP
VHR-7540G	NOT USE	USE	M50959-292SP
VHR-7500EX	NOT USE	NOT USE	M50958-294SP


S7114 EJECT
S7115 POWER
VR771 10K(B)
SOFT — SHARP
PICTURE
CN724
SEG b
SEG c
KEY IN3
GND
PICTURE
SWD 5V
TO TM-1 CN714
TM-2

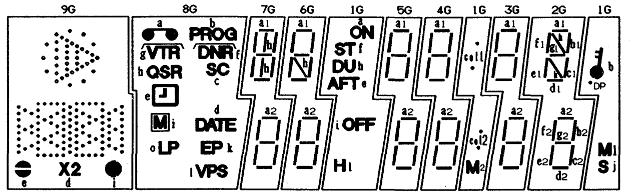

CN714
TR- S7120
TR+ S7108
PRESET S7129
DOWN S7118
R7105
J7120
J7105
J7108
J7101
X7102
PAL
SECAM
MESECAM


CN794
POWER
S7115
EJECT
S7114
1AC4B10A41900B
TM-2
CN799

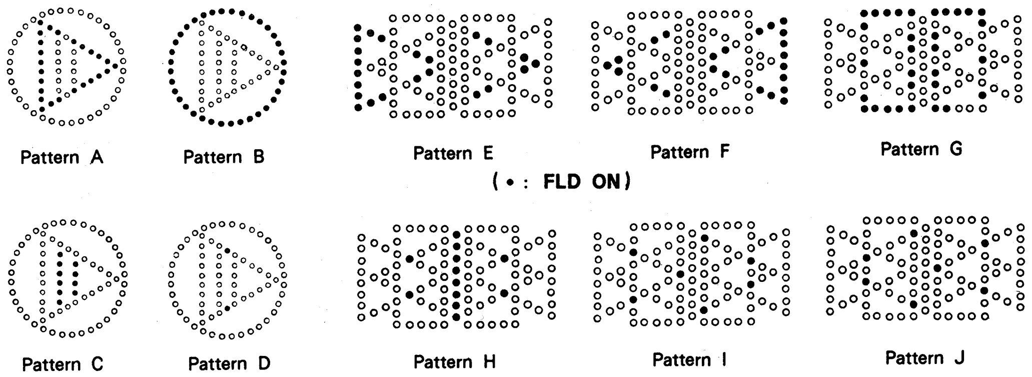
ANODE CONNECTION

	9G	8G	7G	6G	5G	4G	3G	2G	1G
a	B	●●	a1	a1	a1	a1	a1	a1	ON
b	A	PROG.	b1	b1	b1	b1	b1	b1	●
c	–	SC	c1	c1	c1	c1	c1	c1	DP
d	×2	DATE	d1	d1	d1	d1	d1	d1	M(1)
e	⊖	◘	e1	e1	e1	e1	e1	e1	AFT
f	C	DNR	f1	f1	f1	f1	f1	f1	ST
g	D	VTR	g1	g1	g1	g1	g1	g1	col'1
h	–	QSR	/	\	–	–	–	\	DU
i	●	M	a2	a2	a2	a2	a2	a2	OFF
j	E	–	b2	b2	b2	b2	b2	b2	S
k	I	EP	c2	c2	c2	c2	c2	c2	–
l	H	VPS	d2	d2	d2	d2	d2	d2	H
m	J	–	e2	e2	e2	e2	e2	e2	M(2)
n	F	–	f2	f2	f2	f2	f2	f2	–
o	G	LP	g2	g2	g2	g2	g2	g2	col'2

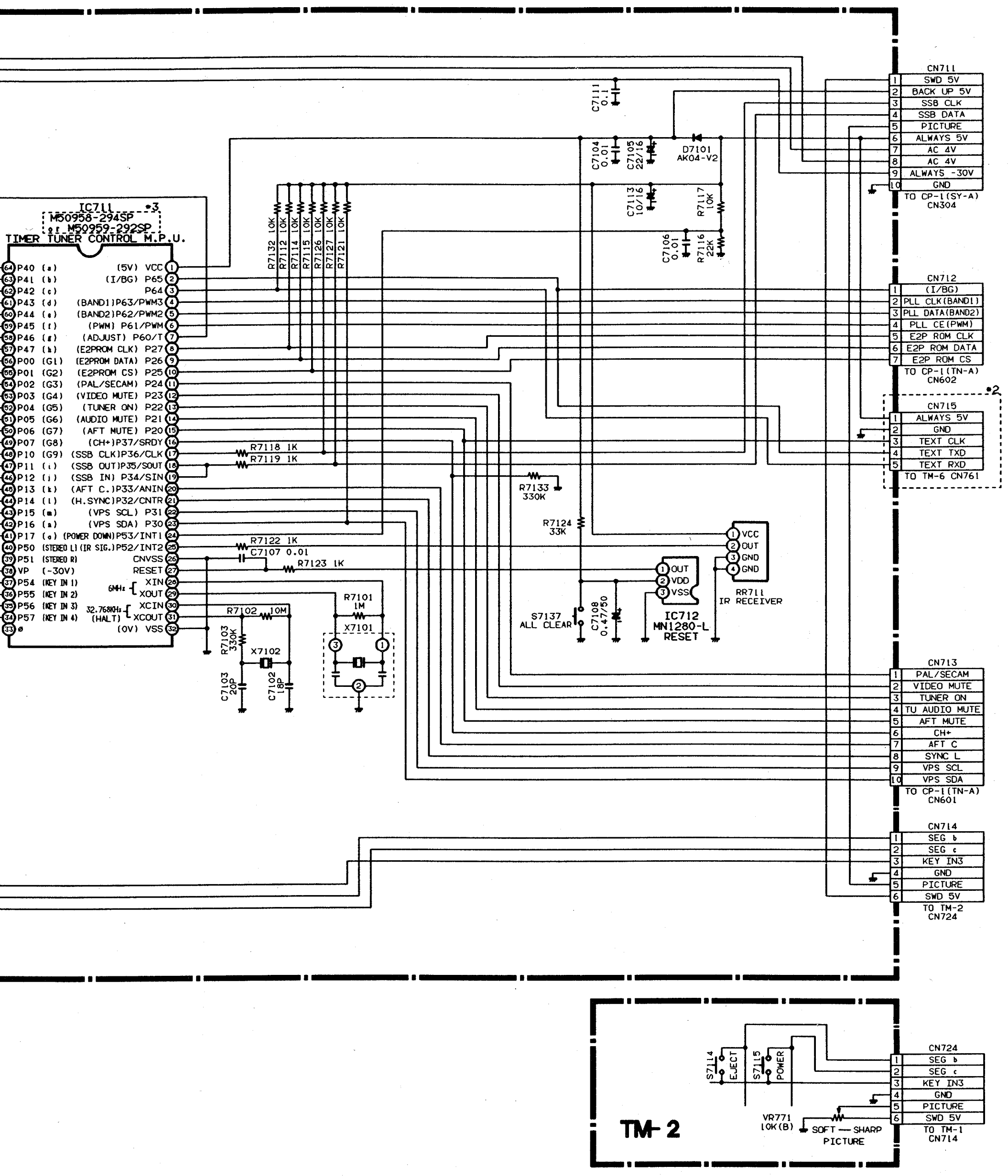
GRID ASSIGNMENT


9G
8G
7G
6G
1G
5G
4G
3G
2G
1G
X2
PROG
VTR
DNR
QSR
SC
DATE
LP
EP
VPS
ON
ST
DU
AFT
OFF
M
S

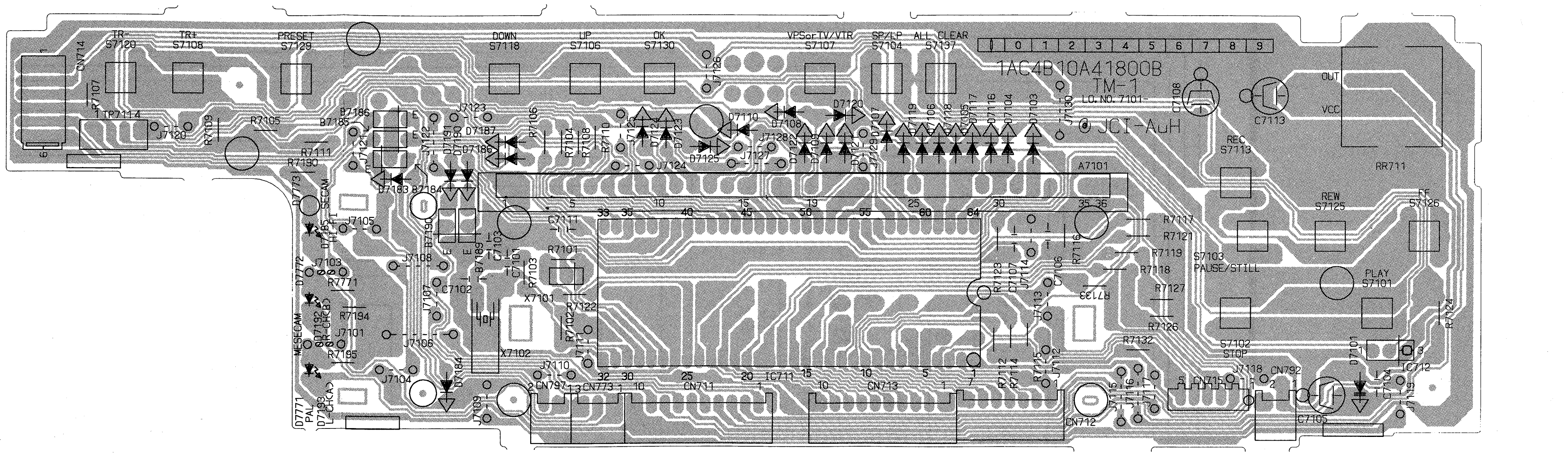
9G: GRAPHIC MODE DISPLAY


Pattern A
Pattern B
Pattern E
Pattern F
Pattern G
(•: FLD ON)
Pattern C
Pattern D
Pattern H
Pattern I
Pattern J

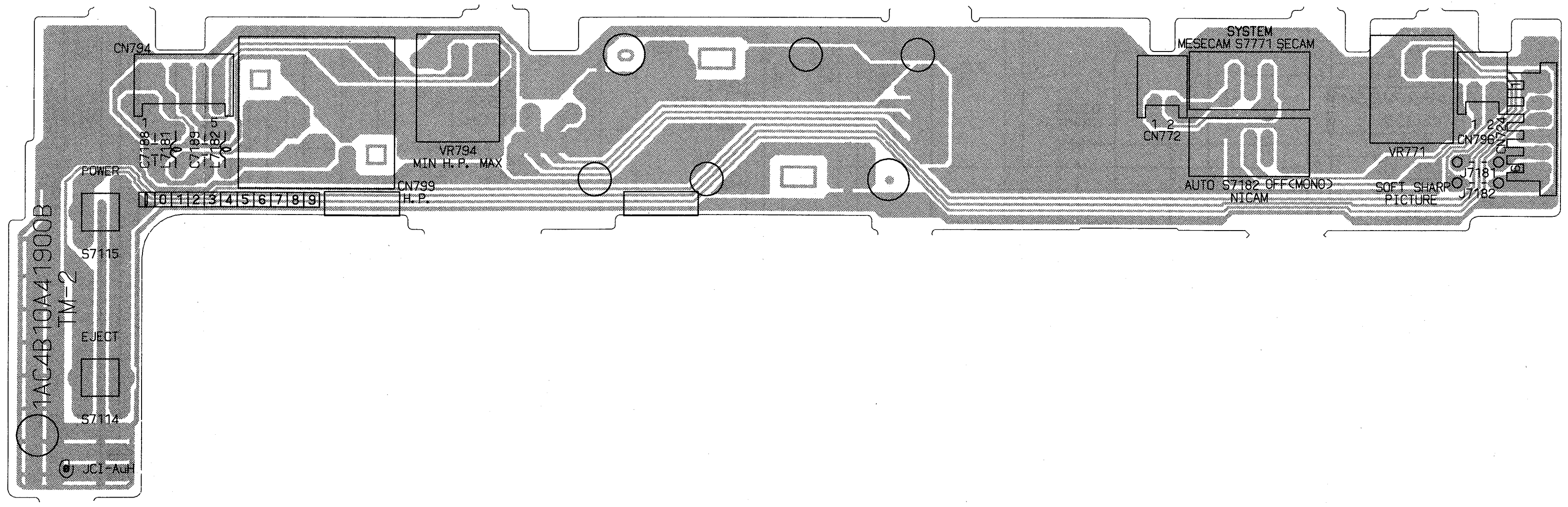
ITROL CIRCUIT DIAGRAM


IC7LL
M50956-294SP
M50959-292SP
TIMER TUNER CONTROL M.P.U.
CN711
TO CP-1(SY-A) CN304
CN712
TO CP-1(TN-A) CN602
CN715
TO TM-6 CN761
CN713
TO CP-1(TN-A) CN601
CN714
TO TM-2 CN724
IC712
MN1280-L
RESET
RR711
IR RECEIVER
S7137
ALL CLEAR
X7101
X7102
D7101
TM-2
CN724
TO TM-1 CN714
S7114 EJECT
S7115 POWER
VR771
SOFT — SHARP
PICTURE

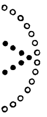
TM-1 P.C.B.

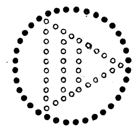

1AC4B10A41800B
TM-1
JCI-AuH
CN714
PRESET S7129
DOWN S7118
UP S7106
OK S7130
VPSorTV/VTR S7107
SP/LP S7104
ALL CLEAR S7137
REC S7113
REW S7125
FF S7126
PLAY S7101
S7103 PAUSE/STILL
S7102 STOP
IC711
IC712
CN711
CN712
CN713
CN715
CN792
CN797
CN773
RR711
A7101
X7101
X7102

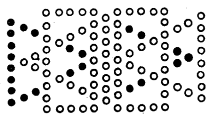
TM-2 P.C.B.

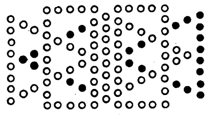

CN794
SYSTEM
MESECAM S7771 SECAM
CN772
AUTO S7182 OFF(MONO)
NICAM
VR794
MIN H.P. MAX
CN793
H.P.
VR771
SOFT SHARP
PICTURE
CN796
POWER
S7115
EJECT
S7114
1AC4B10A41900B
TM-2
JCI-AuH

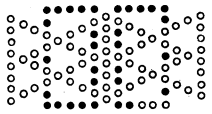
APHIC MODE DISPLAY


A


Pattern B

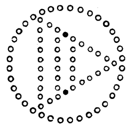

Pattern E

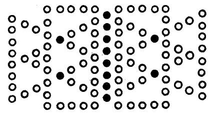

Pattern F

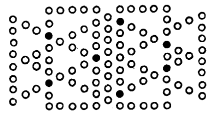

Pattern G

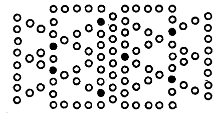
(• : FLD ON)

C

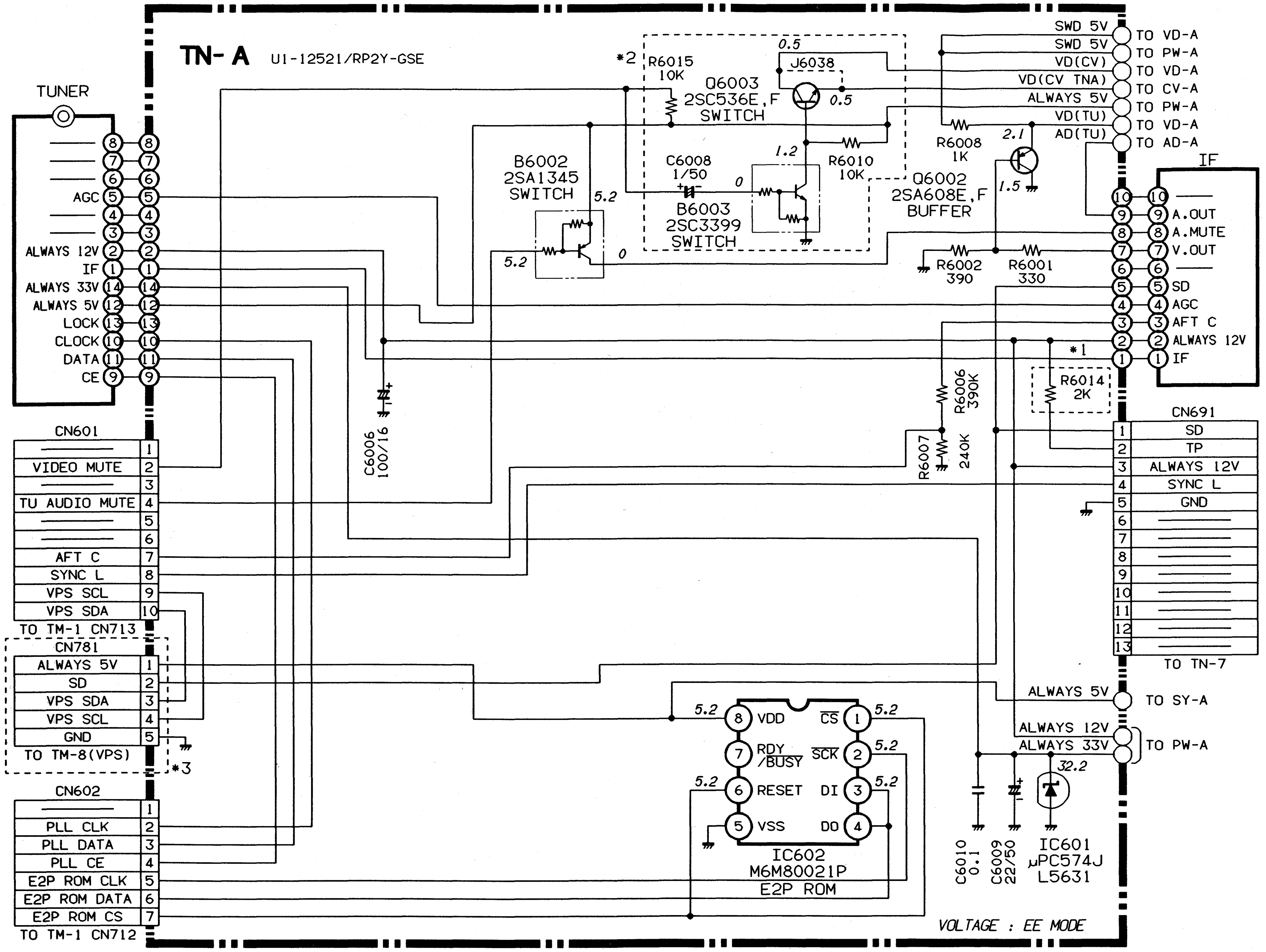

Pattern D


Pattern H


Pattern I


Pattern J

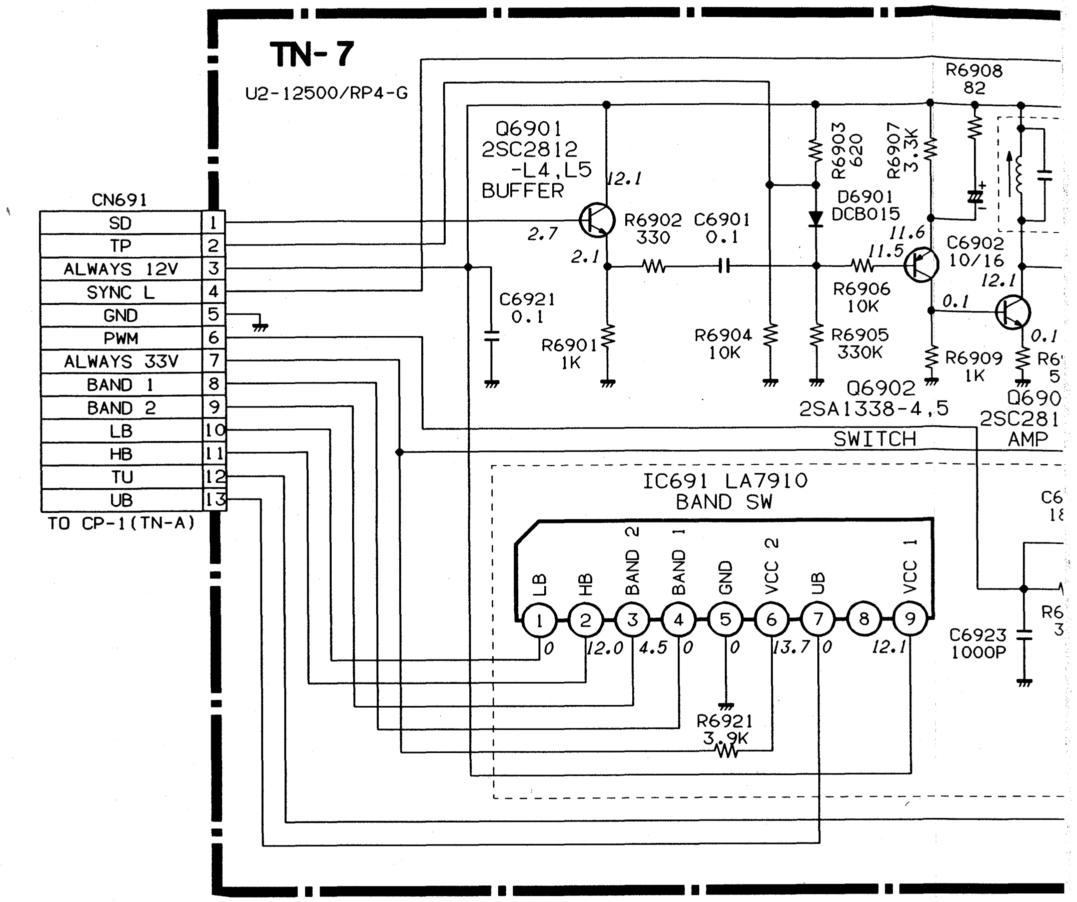
CP-1 BOARD (TN-A) TUNER IF CONNECTION CIRCUIT DIAGRAM (VHR-7500G, VHR-7530G, VHR-7540G, VHR-8500SP)


TN-A U1-12521/RP2Y-GSE
TUNER
AGC
ALWAYS 12V
IF
ALWAYS 33V
ALWAYS 5V
LOCK
CLOCK
DATA
CE
CN601
VIDEO MUTE
TU AUDIO MUTE
AFT C
SYNC L
VPS SCL
VPS SDA
TO TM-1 CN713
CN781
ALWAYS 5V
SD
VPS SDA
VPS SCL
GND
TO TM-8(VPS)
*3
CN602
PLL CLK
PLL DATA
PLL CE
E2P ROM CLK
E2P ROM DATA
E2P ROM CS
TO TM-1 CN712
*2 R6015 10K
Q6003 2SC536E,F SWITCH
J6038
B6002 2SA1345 SWITCH
C6008 1/50
B6003 2SC3399 SWITCH
R6010 10K
Q6002 2SA608E,F BUFFER
R6008 1K
R6002 390
R6001 330
C6006 100/16
R6006 390K
R6007 240K
*1 R6014 2K
SWD 5V TO VD-A
SWD 5V TO PW-A
VD(CV) TO VD-A
VD(CV TNA) TO CV-A
ALWAYS 5V TO PW-A
VD(TU) TO VD-A
AD(TU) TO AD-A
IF
A.OUT
A.MUTE
V.OUT
SD
AGC
AFT C
ALWAYS 12V
IF
CN691
SD
TP
ALWAYS 12V
SYNC L
GND
TO TN-7
ALWAYS 5V TO SY-A
ALWAYS 12V
ALWAYS 33V TO PW-A
IC602 M6M80021P E2P ROM
VDD
CS
RDY /BUSY
SCK
RESET
DI
VSS
DO
C6010 0.1
C6009 22/50
IC601 µPC574J L5631
VOLTAGE : EE MODE

NOTE

	*1	*2		*3
	R6014	B6003,Q6003,C6008,R6010,R6015	J6038	CN781
VHR-7500G VHR-7530G	USE	USE	NOT USE	USE
VHR-8500SP	NOT USE	USE	NOT USE	NOT USE
VHR-7540G	USE	NOT USE	USE	USE

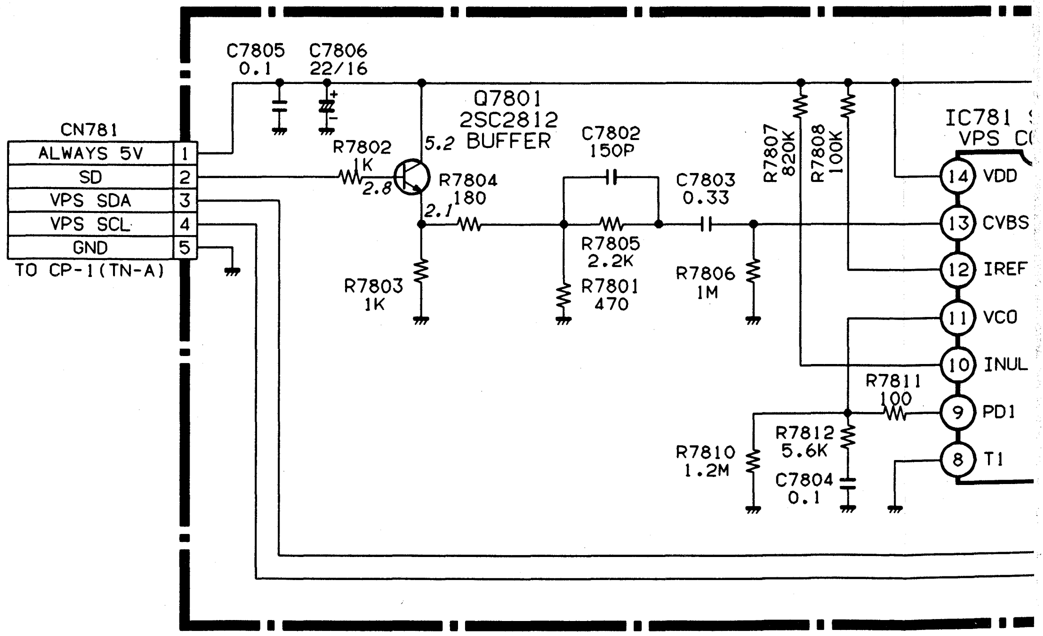
TN-7 BOARD SYNC DET. CIRCUIT


TN-7
U2-12500/RP4-G
CN691
SD
TP
ALWAYS 12V
SYNC L
GND
PWM
ALWAYS 33V
BAND 1
BAND 2
LB
HB
TU
UB
TO CP-1(TN-A)
Q6901 2SC2812 -L4,L5 BUFFER
R6908 82
R6903 620
R6907 3.3K
D6901 DCB015
R6902 330
C6901 0.1
C6921 0.1
R6901 1K
R6904 10K
R6905 330K
R6906 10K
C6902 10/16
R6909 1K
Q6902 2SA1338-4,5 SWITCH
2SC281
AMP
IC691 LA7910 BAND SW
LB
HB
BAND 2
BAND 1
GND
VCC 2
UB
VCC 1
R6921 3.9K
C6923 1000P

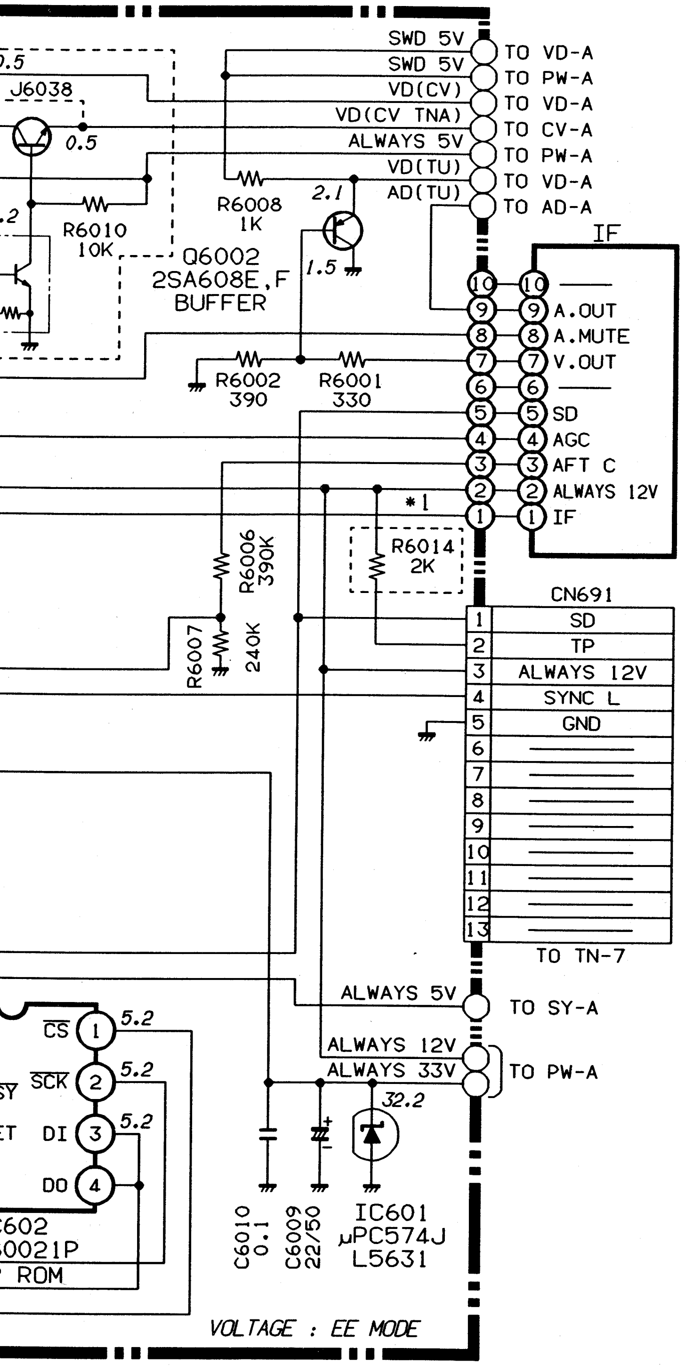
NOTE

	*1
VHR-7500G VHR-7530G VHR-7540G VHR-8500SP	NOT USE
VHR-7500EX	USE

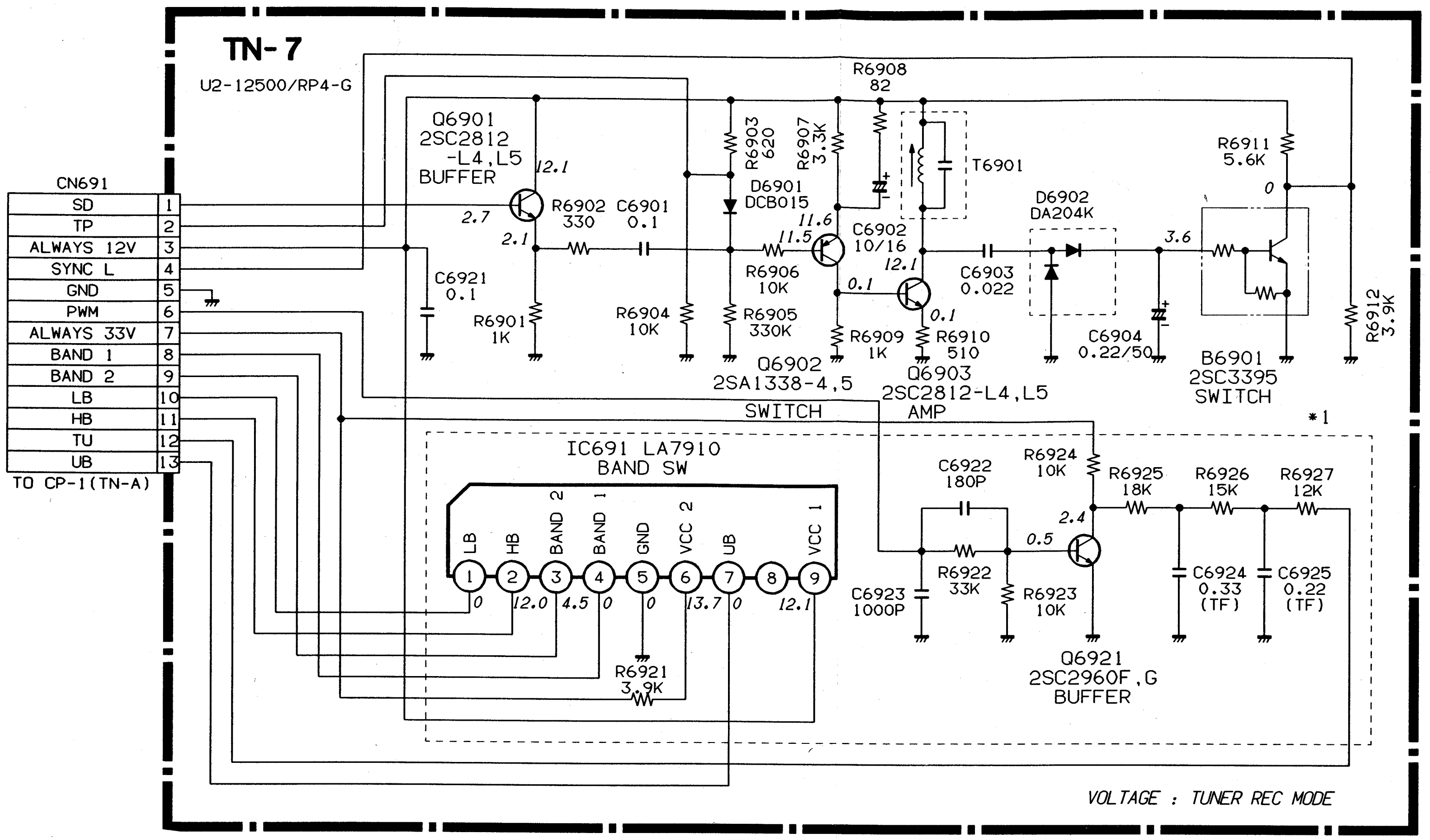
TM-8 BOARD VPS CIRCUIT DIAGRAM (VHR-7500G, VHR-75


CN781
ALWAYS 5V
SD
VPS SDA
VPS SCL
GND
TO CP-1(TN-A)
C7805 0.1
C7806 22/16
Q7801 2SC2812 BUFFER
R7802 1K
R7804 180
R7803 1K
C7802 150P
R7805 2.2K
R7801 470
C7803 0.33
R7806 1M
R7807 820K
R7808 100K
R7811 100
R7812 5.6K
R7810 1.2M
C7804 0.1
IC781
VPS C
VDD
CVBS
IREF
VCO
INUL
PD1
T1

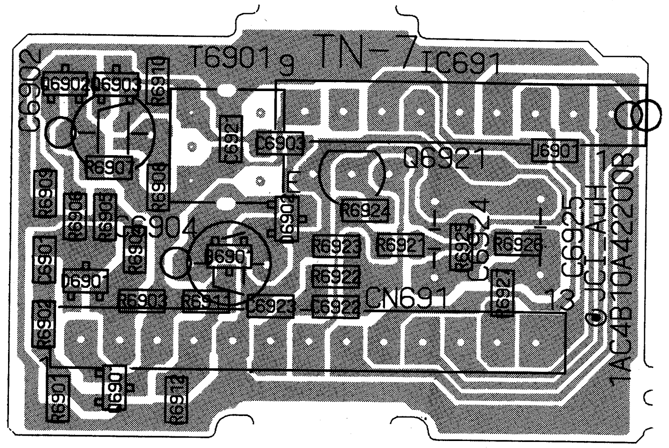
GRAM (VHR-7500G, VHR-7530G,


SWD 5V TO VD-A
SWD 5V TO PW-A
VD(CV) TO VD-A
VD(CV TNA) TO CV-A
ALWAYS 5V TO PW-A
VD(TU) TO VD-A
AD(TU) TO AD-A
J6038
R6008 1K
R6010 10K
Q6002 2SA608E,F BUFFER
R6002 390
R6001 330
IF
A.OUT
A.MUTE
V.OUT
SD
AGC
AFT C
ALWAYS 12V
IF
R6014 2K
*1
R6006 390K
R6007 240K
CN691
SD
TP
ALWAYS 12V
SYNC L
GND
TO TN-7
ALWAYS 5V TO SY-A
ALWAYS 12V
ALWAYS 33V TO PW-A
CS
SCK
DI
DO
C6010 0.1
C6009 22/50
IC601 μPC574J L5631
ROM
VOLTAGE : EE MODE

TN-7 BOARD SYNC DET. CIRCUIT DIAGRAM


TN-7
U2-12500/RP4-G
CN691
SD
TP
ALWAYS 12V
SYNC L
GND
PWM
ALWAYS 33V
BAND 1
BAND 2
LB
HB
TU
UB
TO CP-1(TN-A)
Q6901 2SC2812 -L4,L5 BUFFER
R6902 330
C6901 0.1
C6921 0.1
R6901 1K
R6904 10K
R6903 620
R6907 3.3K
R6908 82
D6901 DCB015
R6906 10K
R6905 330K
Q6902 2SA1338-4,5 SWITCH
C6902 10/16
R6909 1K
R6910 510
Q6903 2SC2812-L4,L5 AMP
T6901
C6903 0.022
D6902 DA204K
C6904 0.22/50
R6911 5.6K
B6901 2SC3395 SWITCH
R6912 3.9K
IC691 LA7910 BAND SW
LB HB BAND 2 BAND 1 GND VCC 2 UB VCC 1
R6921 3.9K
C6922 180P
R6924 10K
R6925 18K
R6926 15K
R6927 12K
C6923 1000P
R6922 33K
R6923 10K
Q6921 2SC2960F,G BUFFER
C6924 0.33 (TF)
C6925 0.22 (TF)
*1
VOLTAGE : TUNER REC MODE

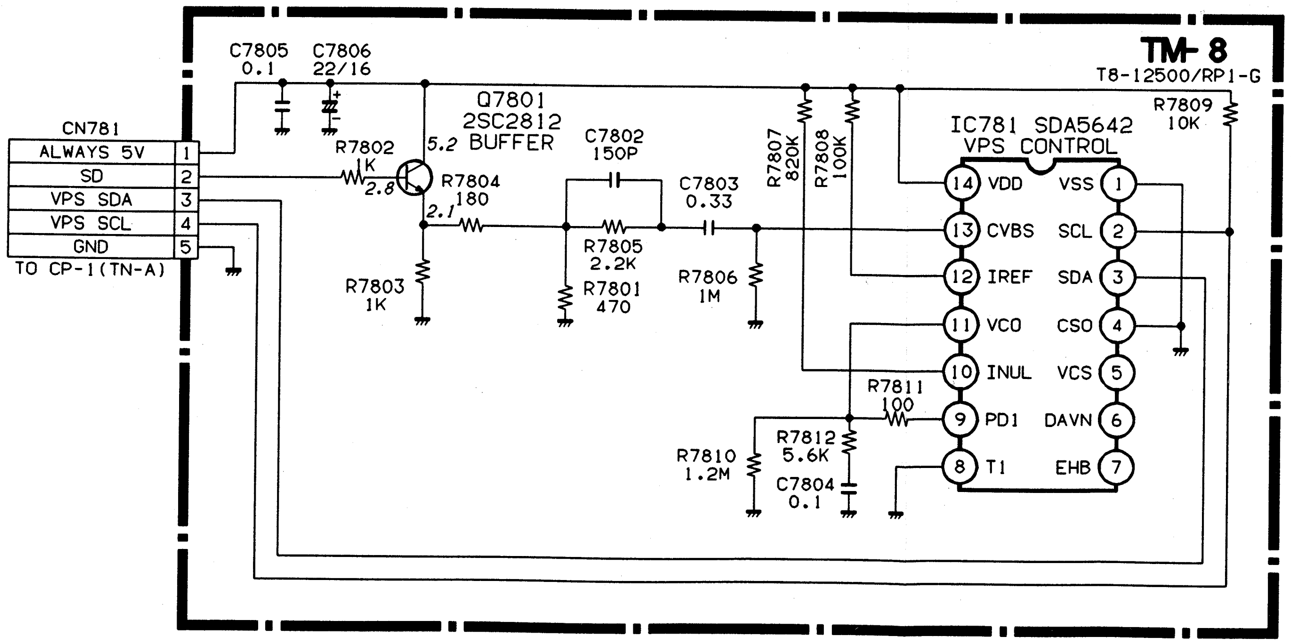
TN-7 P.C.B.


TN-7
T6901
IC691
Q6921
CN691
1AC4B10A42200B
JCI-AuH

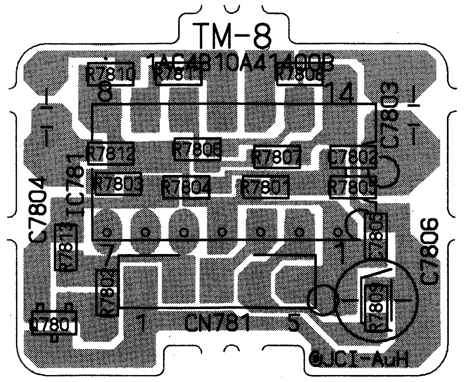
NOTE

	*1
VHR-7500G VHR-7530G VHR-7540G VHR-8500SP	NOT USE
VHR-7500EX	USE

TM-8 BOARD VPS CIRCUIT DIAGRAM (VHR-7500G, VHR-7530G, VHR-7540G)

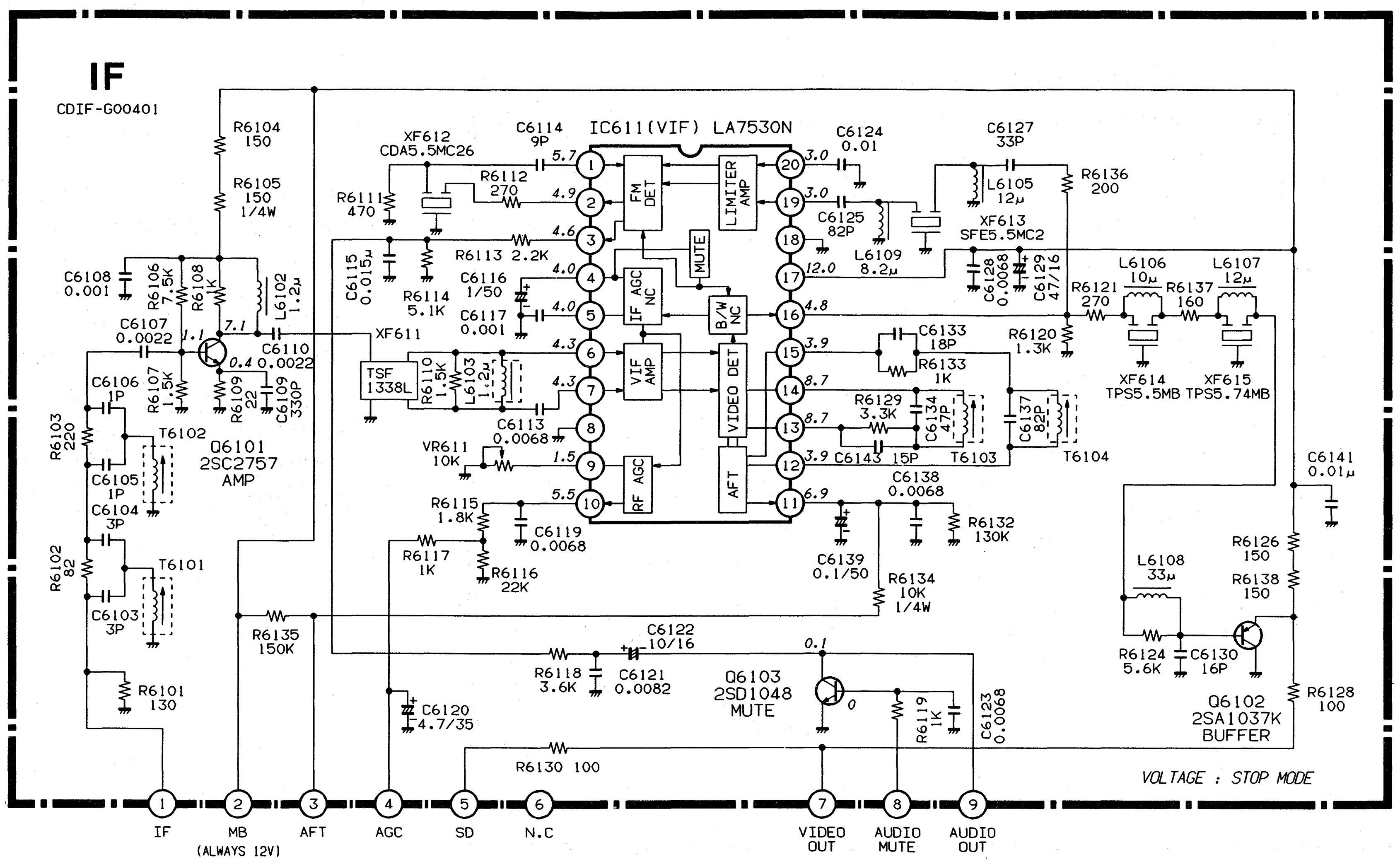

TM-8
T8-12500/RP1-G
CN781
ALWAYS 5V
VPS SDA
VPS SCL
GND
TO CP-1(TN-A)
C7805 0.1
C7806 22/16
Q7801 2SC2812 BUFFER
R7802 1K
R7804 180
R7803 1K
C7802 150P
R7805 2.2K
R7801 470
C7803 0.33
R7806 1M
R7807 820K
R7808 100K
R7809 10K
IC781 SDA5642 VPS CONTROL
VDD CVBS IREF VCO INUL PD1 T1
VSS SCL SDA CSO VCS DAVN EHB
R7811 100
R7812 5.6K
R7810 1.2M
C7804 0.1

TM-8 P.C.B. (VHR-7500G, VHR-7530G, VHR-7540G)

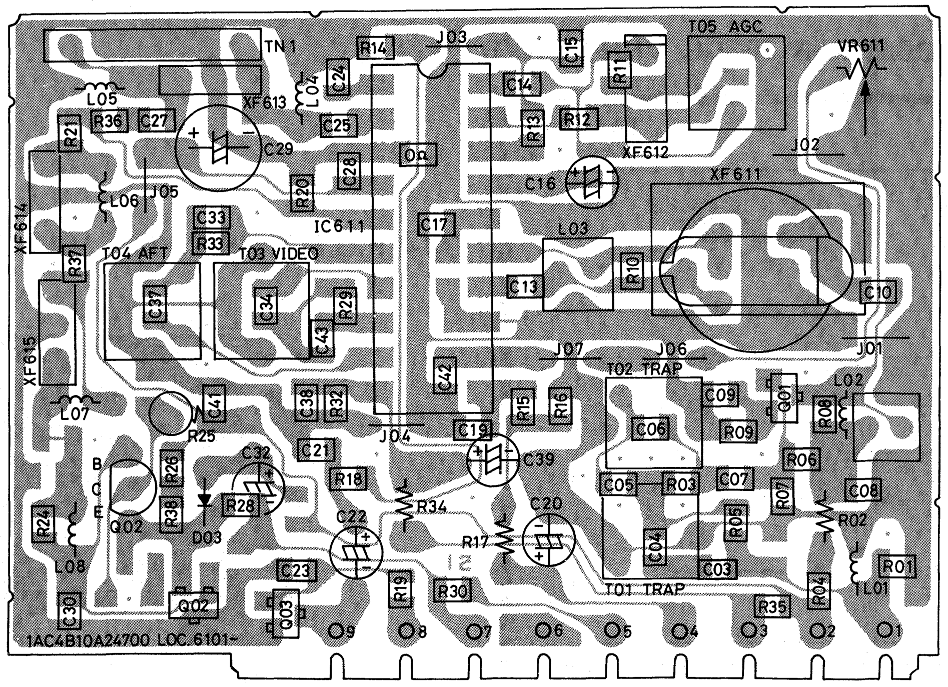

TM-8
1AC4B10A41400B
IC781
CN781
JCI-AuH

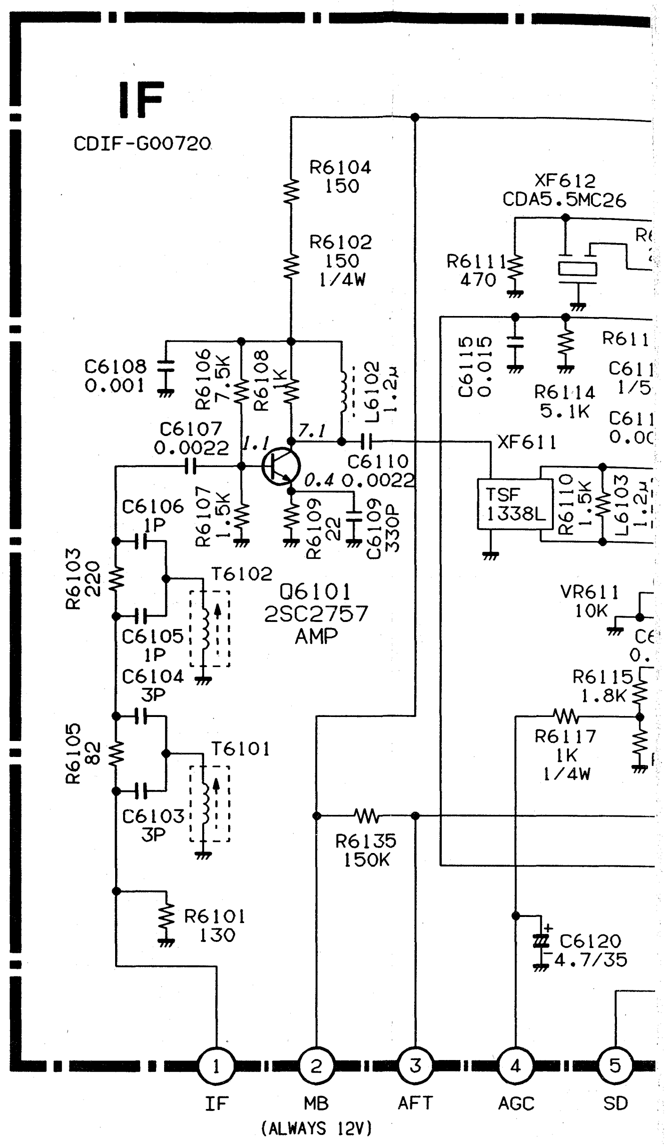
7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23

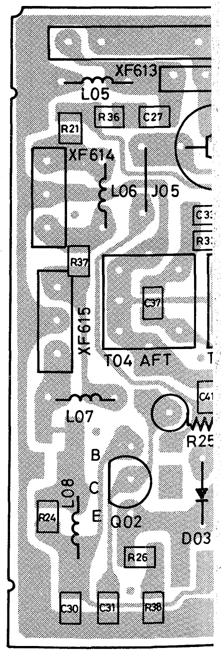
IF CIRCUIT DIAGRAM


IF
CDIF-G00401
IC611(VIF) LA7530N
R6104 150
R6105 150 1/4W
C6108 0.001
R6106 7.5K
R6108 1K
L6102 1.2μ
C6107 0.0022
C6110 0.0022
R6107 1.5K
R6109 22
C6109 330P
R6103 220
C6106 1P
C6105 1P
C6104 3P
T6102
Q6101 2SC2757 AMP
R6102 82
T6101
C6103 3P
R6101 130
R6135 150K
XF612 CDA5.5MC26
R6111 470
C6114 9P
R6112 270
R6113 2.2K
C6115 0.015μ
R6114 5.1K
C6116 1/50
C6117 0.001
XF611
TSF 1338L
R6110 1.5K
L6103 1.2μ
C6113 0.0068
VR611 10K
R6115 1.8K
C6119 0.0068
R6117 1K
R6116 22K
C6120 4.7/35
FM DET
LIMITER AMP
MUTE
IF AGC NC
B/W NC
VIF AMP
VIDEO DET
RF AGC
AFT
5.7
4.9
4.6
4.0
4.0
4.3
4.3
1.5
5.5
3.0
3.0
12.0
4.8
3.9
8.7
8.7
3.9
6.9
C6124 0.01
C6125 82P
L6109 8.2μ
C6127 33P
L6105 12μ
XF613 SFE5.5MC2
R6136 200
C6128 0.0068
C6129 47/16
L6106 10μ
L6107 12μ
R6121 270
R6137 160
XF614 TPS5.5MB
XF615 TPS5.74MB
C6133 18P
R6133 1K
R6120 1.3K
R6129 3.3K
C6134 47P
C6143 15P
T6103
C6137 82P
T6104
C6138 0.0068
R6132 130K
C6139 0.1/50
R6134 10K 1/4W
C6141 0.01μ
L6108 33μ
R6126 150
R6138 150
R6124 5.6K
C6130 16P
R6128 100
Q6102 2SA1037K BUFFER
C6122 10/16
R6118 3.6K
C6121 0.0082
Q6103 2SD1048 MUTE
0.1
0
R6119 1K
C6123 0.0068
R6130 100
VOLTAGE : STOP MODE
1 IF
2 MB (ALWAYS 12V)
3 AFT
4 AGC
5 SD
6 N.C
7 VIDEO OUT
8 AUDIO MUTE
9 AUDIO OUT

IF P.C.B.

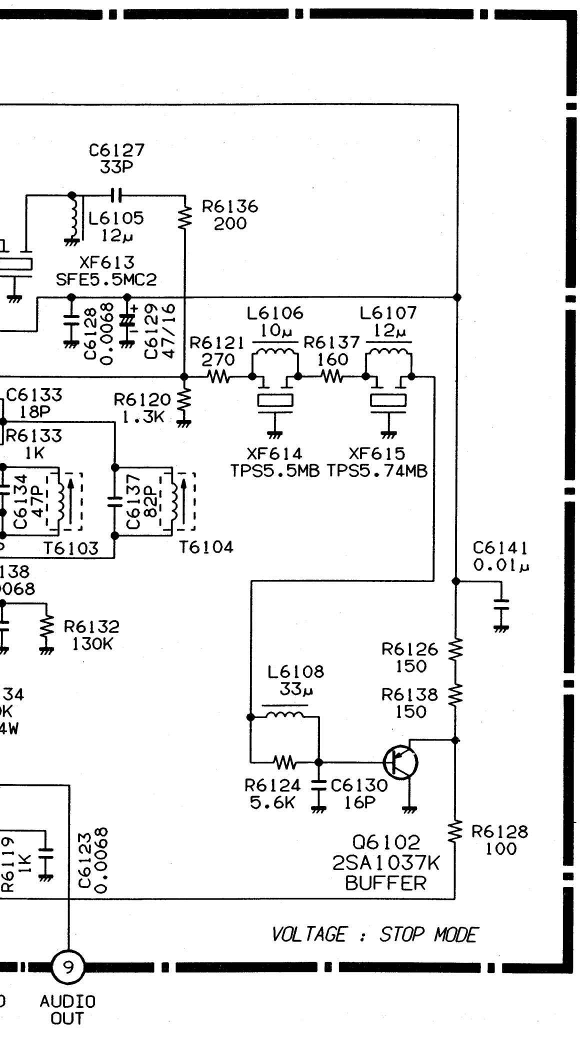

TN1
J03
R14
C24
C15
T05 AGC
VR611
L05
XF613
L04
C14
R11
R36
C27
C25
R13
R12
XF612
R21
C29
J02
R20
C28
C16
XF611
L06
J05
IC611
C17
L03
XF614
C33
R33
T04 AFT
T03 VIDEO
R10
C37
C34
R29
C13
C10
R37
C43
C42
J07
J06
J01
XF615
T02 TRAP
L02
L07
C41
C38
R32
J04
C19
R15
R16
C06
C09
Q01
R08
R25
C32
C21
R09
B
C
E
R26
C39
R06
Q02
R38
R28
R18
R34
C20
C05
R03
C07
C08
R24
D03
C22
R17
R05
R07
R02
L08
C23
C04
C03
R01
C30
Q02
Q03
R19
R30
T01 TRAP
R35
R04
L01
1AC4B10A24700 LOC.6101~
9
8
7
6
5
4
3
2
1

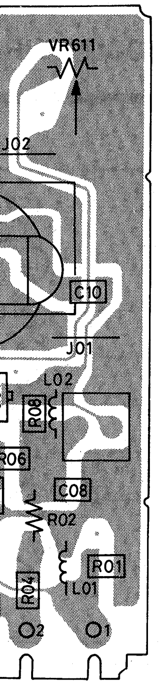

IF
CDIF-G00720
R6104 150
R6102 150 1/4W
XF612 CDA5.5MC26
R6111 470
C6115 0.015
R6114 5.1K
C6108 0.001
R6106 7.5K
R6108 1K
L6102 1.2μ
C6107 0.0022
7.1
1.1
0.4
C6110 0.0022
XF611
TSF 1338L
R6110 1.5K
L6103 1.2μ
R6107 1.5K
R6109 22
C6109 330P
C6106 1P
R6103 220
T6102
Q6101 2SC2757 AMP
C6105 1P
C6104 3P
VR611 10K
R6115 1.8K
R6117 1K 1/4W
R6105 82
T6101
C6103 3P
R6135 150K
R6101 130
C6120 4.7/35
1 IF
2 MB (ALWAYS 12V)
3 AFT
4 AGC
5 SD


XF613
L05
R36
C27
R21
XF614
L06
J05
R37
XF615
T04 AFT
L07
L08
B
C
E
Q02
D03
R24
R26
C30
C31
R38

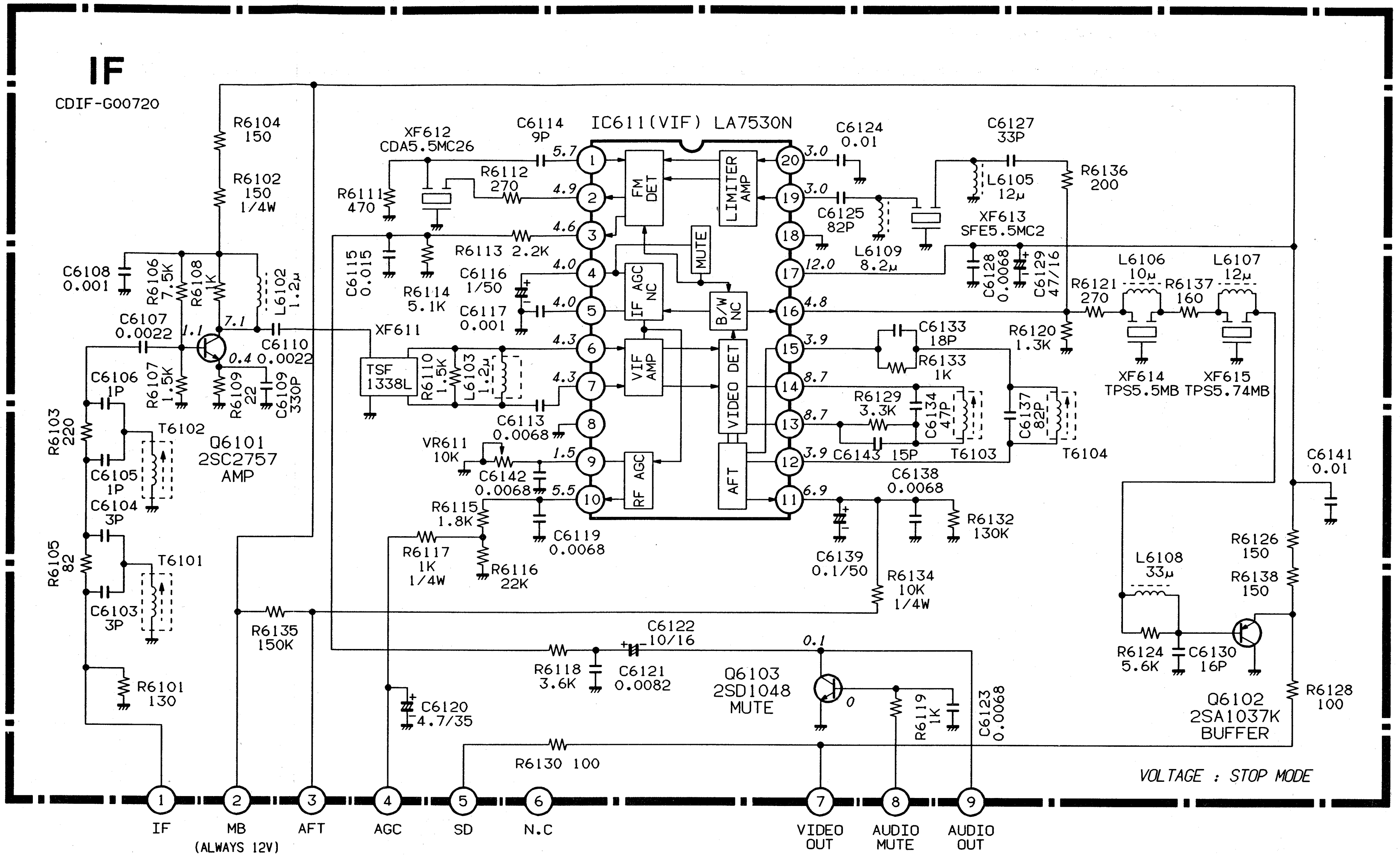
K
J
I
H
G
F
E
D
C
B
A

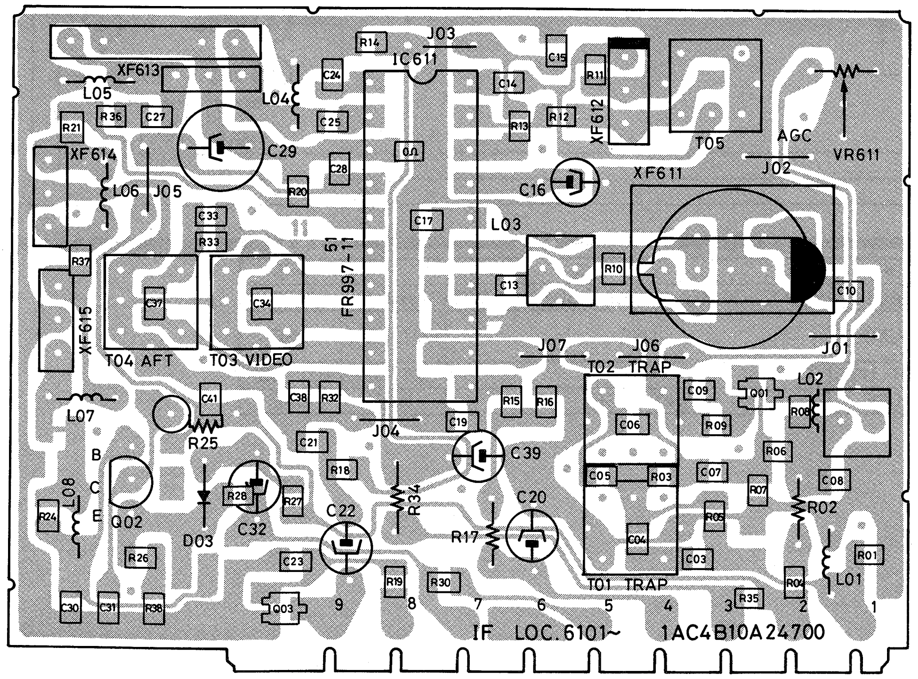
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17


C6127 33P
L6105 12μ
R6136 200
XF613 SFE5.5MC2
C6128 0.0068
C6129 47/16
L6106 10μ
L6107 12μ
R6121 270
R6137 160
C6133 18P
R6120 1.3K
R6133 1K
XF614 TPS5.5MB
XF615 TPS5.74MB
C6137 82P
T6103
T6104
C6141 0.01μ
R6132 130K
L6108 33μ
R6126 150
R6138 150
R6124 5.6K
C6130 16P
Q6102 2SA1037K BUFFER
R6128 100
C6123 0.0068
VOLTAGE : STOP MODE
9
AUDIO OUT


VR611
J02
C10
J01
L02
R08
R06
C08
R02
R01
R04
L01

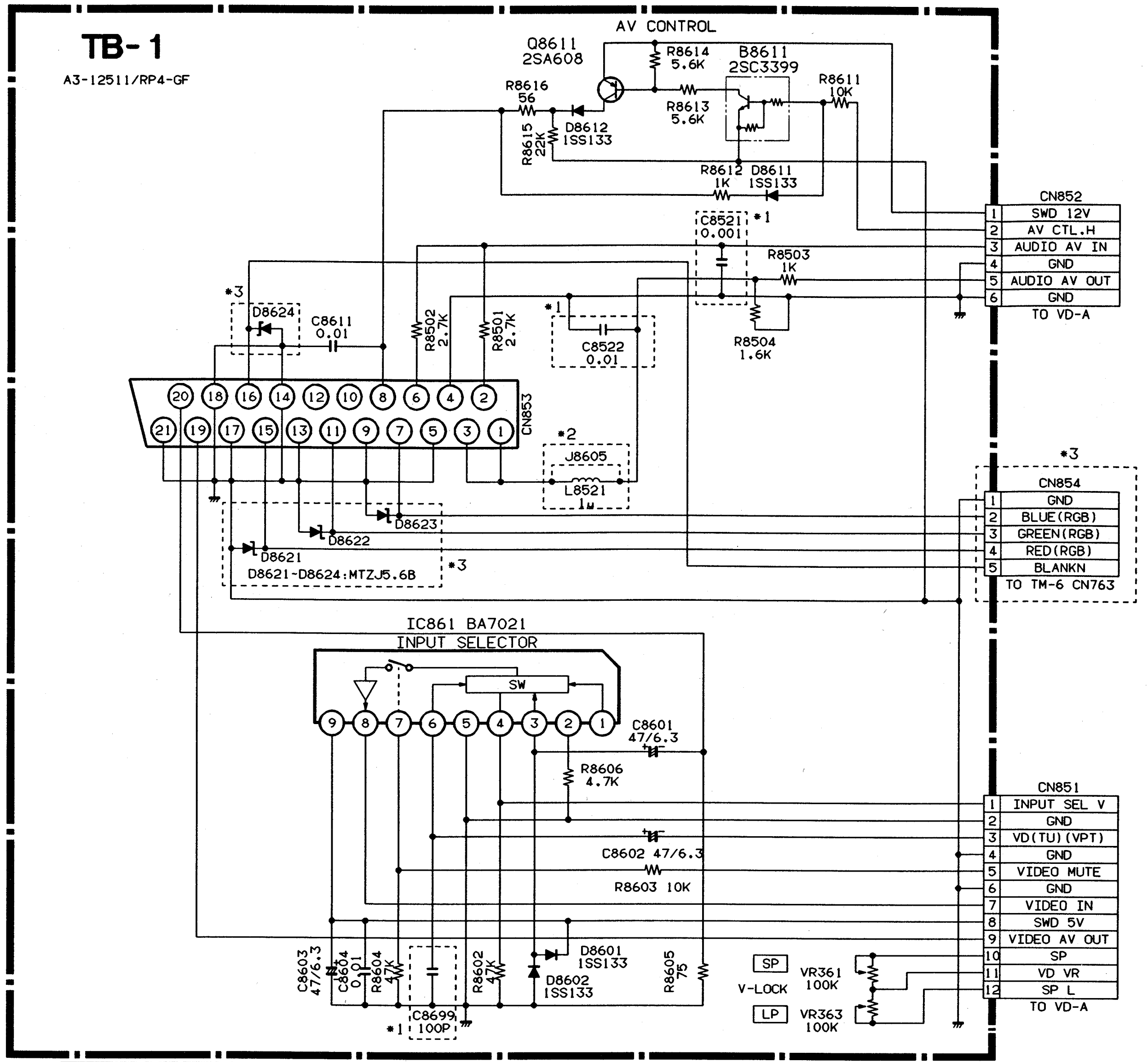
RF CONVERTER CIRCUIT DIAGRAM


IF
CDIF-G00720
IC611 (VIF) LA7530N
FM DET
LIMITER AMP
MUTE
IF AGC NC
B/W NC
VIF AMP
VIDEO DET
RF AGC
AFT
R6104 150
R6102 150 1/4W
C6108 0.001
R6106 7.5K
R6108 1K
L6102 1.2μ
C6107 0.0022
C6110 0.0022
C6109 330P
R6109 22
C6106 1P
R6107 1.5K
R6103 220
T6102
Q6101 2SC2757 AMP
C6105 1P
C6104 3P
R6105 82
T6101
C6103 3P
R6101 130
XF612 CDA5.5MC26
C6114 9P
R6112 270
R6111 470
R6113 2.2K
C6115 0.015
R6114 5.1K
C6116 1/50
C6117 0.001
XF611
TSF 1338L
R6110 1.5K
L6103 1.2μ
C6113 0.0068
VR611 10K
C6142 0.0068
R6115 1.8K
C6119 0.0068
R6117 1K 1/4W
R6116 22K
R6135 150K
C6120 4.7/35
C6124 0.01
C6125 82P
L6109 8.2μ
C6127 33P
L6105 12μ
R6136 200
XF613 SFE5.5MC2
C6128 0.0068
C6129 47/16
R6121 270
L6106 10μ
R6137 160
L6107 12μ
R6120 1.3K
XF614 TPS5.5MB
XF615 TPS5.74MB
C6133 18P
R6133 1K
R6129 3.3K
C6134 47P
C6137 82P
T6103
T6104
C6143 15P
C6138 0.0068
R6132 130K
C6139 0.1/50
R6134 10K 1/4W
C6141 0.01
L6108 33μ
R6126 150
R6138 150
R6124 5.6K
C6130 16P
Q6102 2SA1037K BUFFER
R6128 100
C6122 10/16
R6118 3.6K
C6121 0.0082
Q6103 2SD1048 MUTE
R6119 1K
C6123 0.0068
R6130 100
VOLTAGE : STOP MODE
5.7
4.9
4.6
4.0
4.0
4.3
4.3
1.5
5.5
3.0
3.0
12.0
4.8
3.9
8.7
8.7
3.9
6.9
7.1
1.1
0.4
0.1
0
1 IF
2 MB (ALWAYS 12V)
3 AFT
4 AGC
5 SD
6 N.C
7 VIDEO OUT
8 AUDIO MUTE
9 AUDIO OUT


J03
IC611
XF613
L05
L04
XF612
T05
AGC
VR611
XF614
L06
J05
C29
C16
XF611
J02
L03
FR997-11
XF615
T04 AFT
T03 VIDEO
J07
J06
T02 TRAP
J01
L02
L07
R25
J04
C39
B
C
E
Q02
D03
C32
C22
R34
C20
R17
R02
L08
T01 TRAP
L01
IF LOC.6101~
1AC4B10A24700
9 8 7 6 5 4 3 2 1

8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24

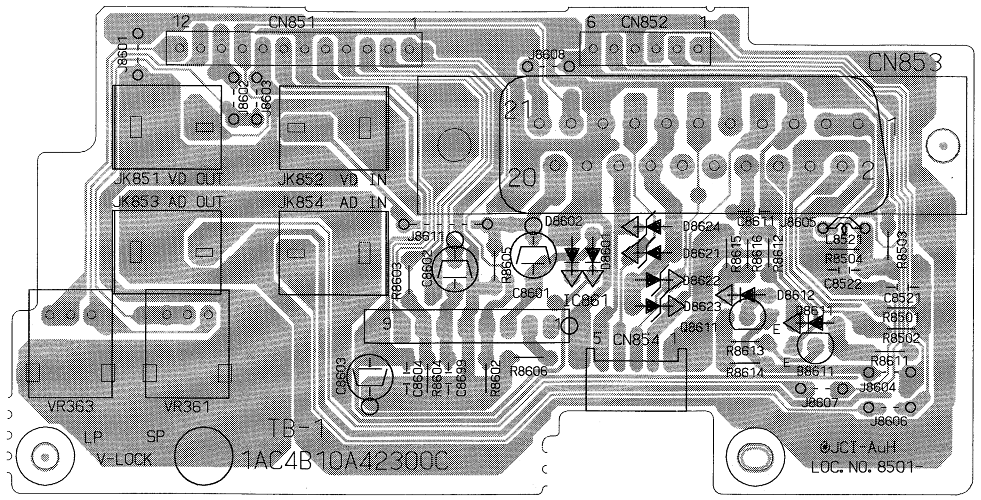
TB-1 BOARD TERMINAL CIRCUIT DIAGRAM


TB-1
A3-12511/RP4-GF
AV CONTROL
Q8611 2SA608
R8614 5.6K
B8611 2SC3399
R8616 56
R8613 5.6K
R8611 10K
D8612 1SS133
R8615 22K
R8612 1K
D8611 1SS133
C8521 0.001
R8503 1K
R8504 1.6K
R8502 2.7K
R8501 2.7K
C8522 0.01
D8624
C8611 0.01
CN853
J8605
L8521 1μ
D8623
D8622
D8621
D8621-D8624:MTZJ5.6B
IC861 BA7021
INPUT SELECTOR
SW
C8601 47/6.3
R8606 4.7K
C8602 47/6.3
R8603 10K
D8601 1SS133
D8602 1SS133
C8603 47/6.3
C8604 0.01
R8604 47K
C8699 100P
R8602 47K
R8605 75
SP
VR361 100K
V-LOCK
LP
VR363 100K
CN852
1 SWD 12V
2 AV CTL.H
3 AUDIO AV IN
4 GND
5 AUDIO AV OUT
6 GND
TO VD-A
CN854
1 GND
2 BLUE(RGB)
3 GREEN(RGB)
4 RED(RGB)
5 BLANKN
TO TM-6 CN763
CN851
1 INPUT SEL V
2 GND
3 VD(TU)(VPT)
4 GND
5 VIDEO MUTE
6 GND
7 VIDEO IN
8 SWD 5V
9 VIDEO AV OUT
10 SP
11 VD VR
12 SP L
TO VD-A
*1
*2
*3

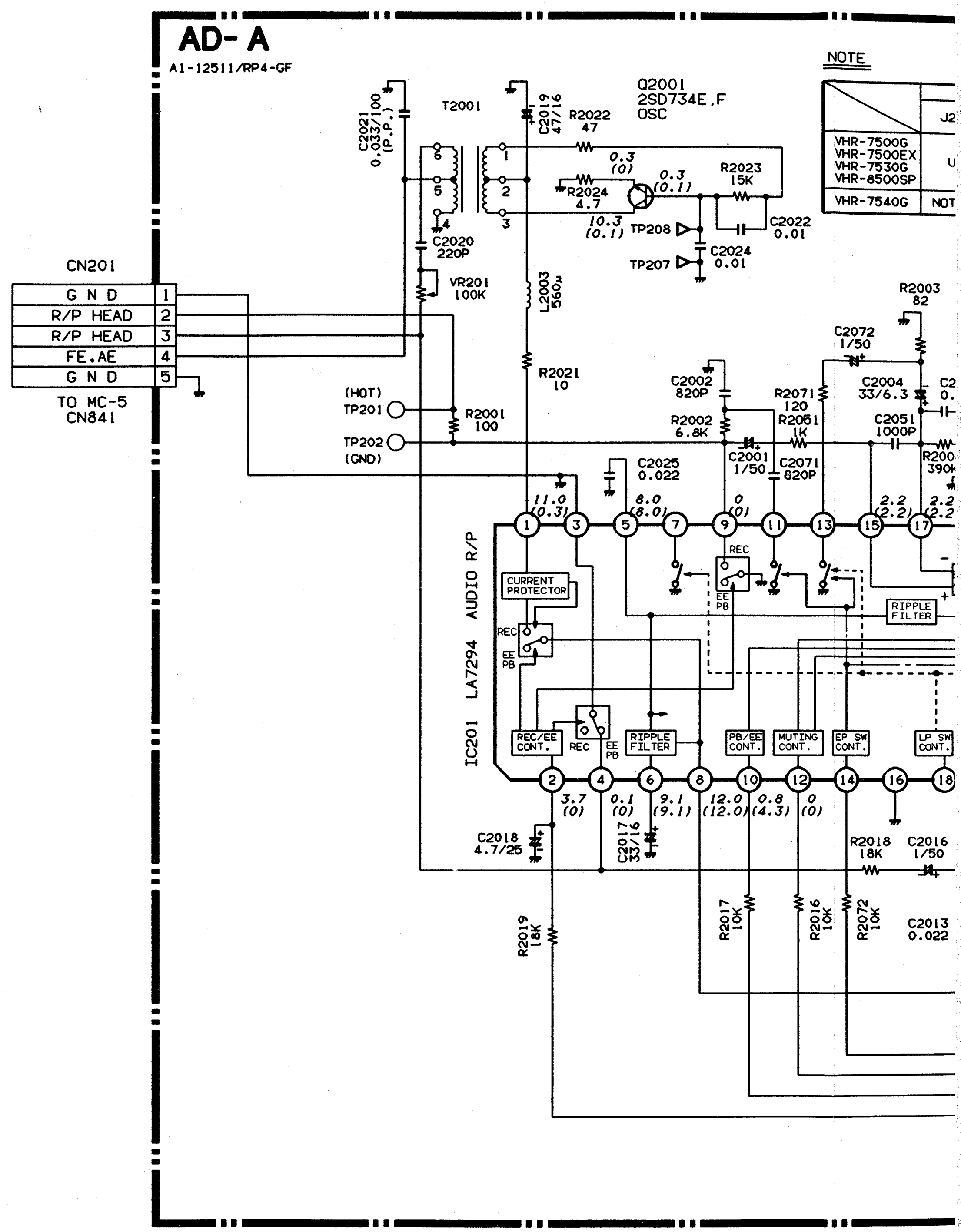
NOTE

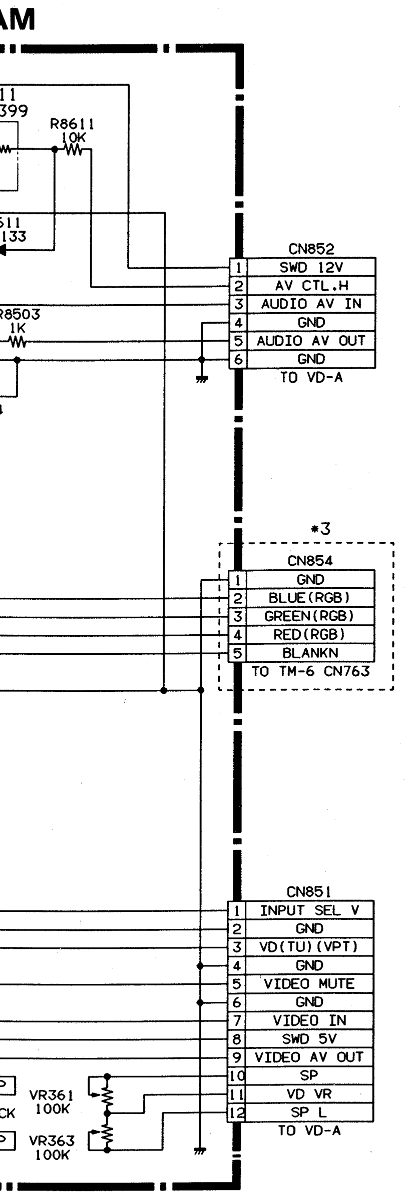
	*1	*2	*3
	C8521,C8522,C8699	L8521 or J8605	CN854,D8621~D8624
VHR-7500EX VHR-8500SP	NOT USE	J8605	NOT USE
VHR-7500G VHR-7530G	USE	L8521	NOT USE
VHR-7540G	USE	L8521	USE

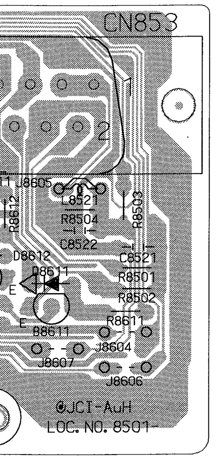
TB-1 P.C.B.


CN851
CN852
CN853
CN854
JK851 VD OUT
JK852 VD IN
JK853 AD OUT
JK854 AD IN
IC861
VR363
VR361
LP
SP
V-LOCK
TB-1
1AC4B10A42300C
©JCI-AuH
LOC. NO. 8501-

CP-1 BOARD (AD-A) AU


AD-A
A1-12511/RP4-GF
NOTE
VHR-7500G
VHR-7500EX
VHR-7530G
VHR-8500SP
VHR-7540G
CN201
1 GND
2 R/P HEAD
3 R/P HEAD
4 FE.AE
5 GND
TO MC-5 CN841
T2001
Q2001 2SD734E,F OSC
C2021 0.033/100 (P.P.)
C2019 47/16
R2022 47
R2024 4.7
R2023 15K
C2022 0.01
C2020 220P
TP208
TP207
C2024 0.01
VR201 100K
L2003 560μ
R2021 10
R2003 82
C2072 1/50
C2002 820P
R2071 120
C2004 33/6.3
(HOT) TP201
TP202 (GND)
R2001 100
R2002 6.8K
C2001 1/50
R2051 1K
C2051 1000P
C2071 820P
C2025 0.022
IC201 LA7294 AUDIO R/P
CURRENT PROTECTOR
REC
EE PB
REC/EE CONT.
RIPPLE FILTER
PB/EE CONT.
MUTING CONT.
EP SW CONT.
LP SW CONT.
C2018 4.7/25
C2017 33/16
R2019 18K
R2017 10K
R2016 10K
R2072 10K
R2018 18K
C2016 1/50
C2013 0.022


AM
R8611 10K
R8503 1K
CN852
1 SWD 12V
2 AV CTL.H
3 AUDIO AV IN
4 GND
5 AUDIO AV OUT
6 GND
TO VD-A
*3
CN854
1 GND
2 BLUE(RGB)
3 GREEN(RGB)
4 RED(RGB)
5 BLANKN
TO TM-6 CN763
CN851
1 INPUT SEL V
2 GND
3 VD(TU)(VPT)
4 GND
5 VIDEO MUTE
6 GND
7 VIDEO IN
8 SWD 5V
9 VIDEO AV OUT
10 SP
11 VD VR
12 SP L
TO VD-A
VR361 100K
VR363 100K


CN853
J8605
C8521
R8504
C8522
R8503
D8612
D8611
C8521
R8501
R8502
R8611
J8604
J8607
J8606
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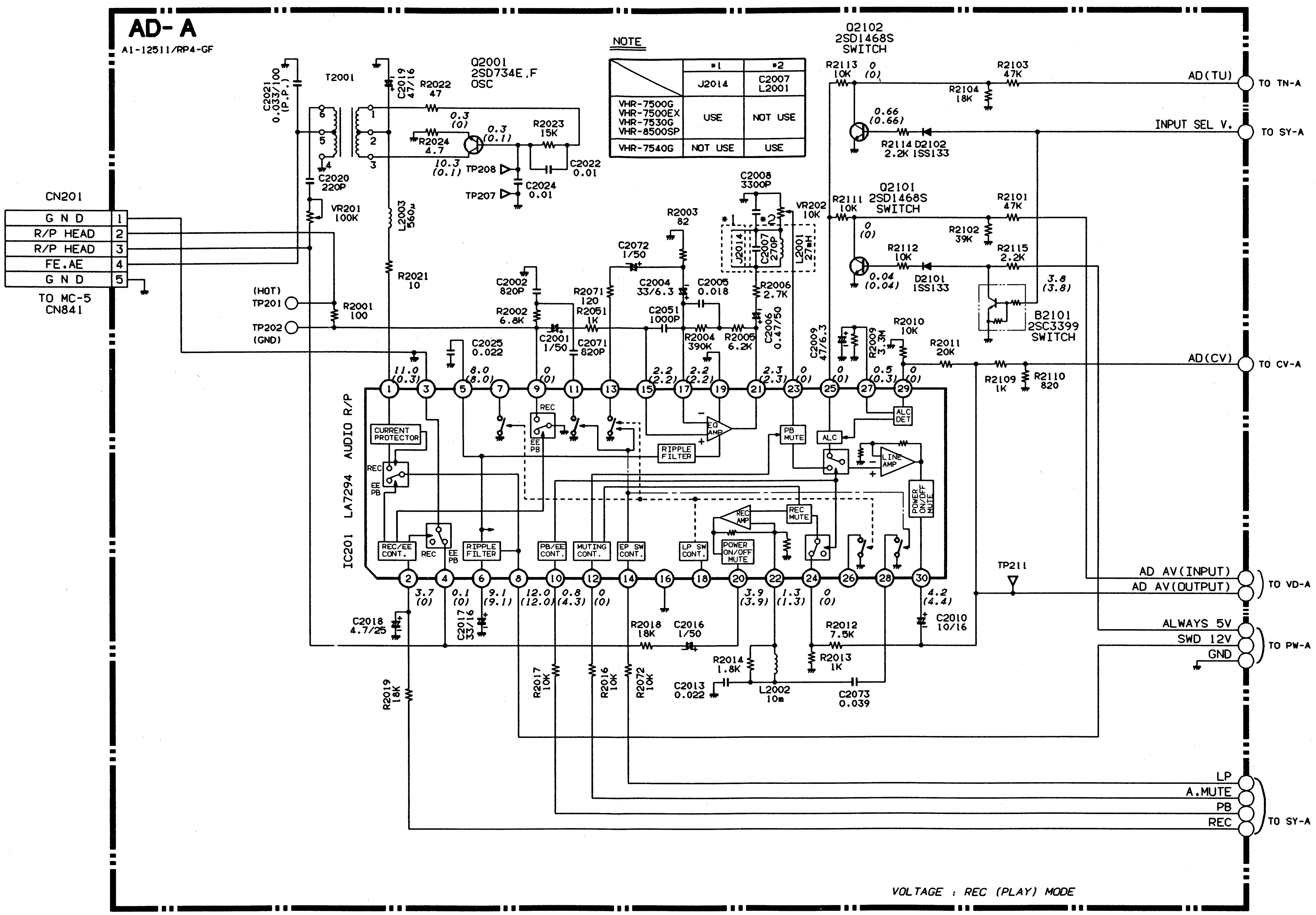
LOC. NO. 8501

CP-1 BOARD (AD-A) AUDIO CIRCUIT DIAGRAM


AD- A
A1-12511/RP4-GF
CN201
1 GND
2 R/P HEAD
3 R/P HEAD
4 FE.AE
5 GND
TO MC-5 CN841
(HOT) TP201
TP202 (GND)
C2021 0.033/100 (P.P.)
T2001
C2019 47/16
R2022 47
Q2001 2SD734E,F OSC
R2024 4.7
R2023 15K
C2022 0.01
TP208
TP207
C2024 0.01
C2020 220P
VR201 100K
L2003 560μ
R2021 10
R2001 100
C2025 0.022
C2002 820P
R2002 6.8K
C2001 1/50
C2071 820P
R2071 120
R2051 1K
C2072 1/50
C2004 33/6.3
C2051 1000P
C2005 0.018
R2003 82
C2008 3300P
VR202 10K
J2014
C2007 270P
L2001 27mH
R2006 2.7K
R2004 390K
R2005 6.2K
C2006 0.47/50
C2009 47/6.3
R2009 3.3M
R2010 10K
R2011 20K
R2109 1K
R2110 820
Q2102 2SD1468S SWITCH
R2113 10K
R2103 47K
R2104 18K
R2114 2.2K
D2102 1SS133
Q2101 2SD1468S SWITCH
R2111 10K
R2101 47K
R2102 39K
R2112 10K
R2115 2.2K
D2101 1SS133
B2101 2SC3399 SWITCH
AD(TU)
TO TN-A
INPUT SEL V.
TO SY-A
AD(CV)
TO CV-A
TP211
AD AV(INPUT)
AD AV(OUTPUT)
TO VD-A
ALWAYS 5V
SWD 12V
GND
TO PW-A
LP
A.MUTE
PB
REC
TO SY-A
IC201 LA7294 AUDIO R/P
CURRENT PROTECTOR
REC
EE PB
REC/EE CONT.
RIPPLE FILTER
PB/EE CONT.
MUTING CONT.
EP SW CONT.
EQ AMP
PB MUTE
ALC
ALC DET
LINE AMP
REC AMP
REC MUTE
LP SW CONT.
POWER ON/OFF MUTE
C2018 4.7/25
C2017 33/16
R2019 18K
R2017 10K
R2016 10K
R2072 10K
R2018 18K
C2016 1/50
R2014 1.8K
C2013 0.022
L2002 10m
R2012 7.5K
R2013 1K
C2073 0.039
C2010 10/16
11.0 (0.3)
8.0 (8.0)
0 (0)
2.2 (2.2)
2.2 (2.2)
2.3 (2.3)
0 (0)
0 (0)
0.5 (0.3)
0 (0)
3.7 (0)
0.1 (0)
9.1 (9.1)
12.0 (12.0)
0.8 (4.3)
0 (0)
3.9 (3.9)
1.3 (1.3)
0 (0)
4.2 (4.4)
10.3 (0.1)
0.3 (0)
0.3 (0.1)
0.66 (0.66)
0 (0)
0.04 (0.04)
3.8 (3.8)
VOLTAGE : REC (PLAY) MODE

NOTE

	*1	*2
	J2014	C2007 L2001
VHR-7500G VHR-7500EX VHR-7530G VHR-8500SP	USE	NOT USE
VHR-7540G	NOT USE	USE

IC301 (μPD75516) SYSTEM CONTROL MPU PIN FUNCTIONS TABLE

NO.	Name	I/O	I/O Signal Function
1	$\overline{\text{TAPE END.S}}$	I	Sensor signal input for tape end detection.
2	A/D REF	I	Reference voltage input for internal A/D conversion circuit. (5 Vdc)
3	VDD		IC power supply input. (5 Vdc)
4	VDD		IC power supply input. (5 Vdc)
5	NOISE ADVANCE P.	O	Pulse for noise band advance in STILL mode.
6	INSERT HIGH	O	"HIGH" output in video signal insert mode. (Models equipped with FE heads.)
7	AF REC	O	"HIGH" output in video signal insert mode, signal to activate FE head.
8	A.DUB	O	"HIGH" output in audio dubbing mode.
9	AUDIO SEL.R	O	Output select signal for stereo audio signals. (ST/L/R/NORMAL).
10	AUDIO SEL.L		
11	INPUT SEL.V	O	Signal for selecting video input signal. (TUNER/EXTERNAL/S.C.)
12	INPUT SEL.A	O	Signal for selecting audio input signal. (TUNER/EXTERNAL/S.C.)
13	S-VHS AUTO/$\overline{\text{OFF}}$	I	S-VHS auto mode selection terminal.
14	BIAS CONTROL	O	Signal for switching full-width erasing head OFF when "HIGH" and ON when "LOW".
15	A REC MUTE	O	Signal to disable output or recording of NORMAL audio.
16	A MUTE	O	Signal to disable audio signal output.
17	NORMAL/$\overline{\text{S-VHS}}$	I	NORMAL (VHS) /S-VHS selection terminal. Normal VHS when "HIGH".
18	$\overline{\text{SV S.DATA}}$	O	Outputs 8-bit × 4 serial data giving operation mode and tracking data, etc., to digital servo IC. CLK is its clock pulse.
19	$\overline{\text{SV S.CLK}}$		
20	4K-PWM	O	Outputs 4 kHz PWM signal for set period at start of high-speed FF/REW.
21	REV HIGH	O	Signal giving skew correction in LP SEARCH mode. (PAL models only)
22	–	–	
23	VD REC	O	Signal indicating recording of video signal in insert mode. (Models equipped with FE head only)
24	FE CONTROL	O	Signal indicating operation of FE head in insert mode. (Models equipped with FE head only)
25	TITL REC	O	Title insert mode indication signal.
26	SPECIAL PLAY	O	Output in special playback modes (R/L-SEARCH, × 2S, STILL, SLOW, F-ADVANCE, A-DUB PAUSE).
27	REC	O	Recording indication signal.
28	$\overline{\text{STILL + SLOW}}$	O	"LOW" output in STILL/SLOW mode for control on-screen IC.
29	ANT/$\overline{\text{VIDEO}}$	O	Antenna through or video deck RF output select (Video when LOW).
30	P.B. HIGH	O	Signal indicating playback image output.
31	FF + REW	O	"HIGH" output during FF or REW mode.
32	POWER UP	O	"HIGH" output except when power is off. Indicates that power is ON.
33	GND		IC ground terminal.
34	$\overline{\text{SAFETY SW}}$	I	Input terminal for accidental erasure prevention switch. No operating to recording mode while "LOW" is input.
35	$\overline{\text{SW DATA 3}}$	I	3-bit signal indicating operation position of mechanism.
36	$\overline{\text{SW DATA 2}}$		
37	$\overline{\text{SW DATA 1}}$		
38	–	–	Pull-up (5 Vdc)
39	FL START SW	I	Switch input indicating start of cassette loading or discharge by front mechanism.
40	60 PWM	O	PWM signal output at high speed FF/REW mode.
41	H.SPEED • SEARCH + FF + REW	O	"HIGH" output during SEARCH, FF and REW at high speed mode.
42	AV CONTROL (8PIN)	O	AV terminal (21PIN SOCKET) control signal output.
43	ATR SMPL P	O	Sampling pulse output during auto-tracking operation. (For ATR evaluation)
44	MC-BR	O	Brake signal for capstan motor.
45	MC-F/R	O	Indication signal for capstan motor rotation direction.
46	INSERT $\overline{\text{ON}}$/OFF	I	INSERT function ON/OFF terminal. Function enabled when "LOW".
47	C-FG P.	I	FG pulse input for capstan motor. Signal with frequency of approximately 1 kHz is recognized.
48	T.REEL P.	I	Pulse input for detection of take-up reel table rotation.
49	CTL P.(0/1 CLK)	I	CTL head recording/playback pulse signal input.
50	S.REEL P.	I	Pulse input for detection of supply reel table rotation.
51	$\overline{\text{SSB DATA}}$	I/O	Terminals for communication of mode data with other microprocessors. Data is 8-bit × 12 block serial data. The clock pulse is output from this microcomputer.
52	$\overline{\text{SSB CLK}}$	O	
53	RF SW P.	I	Input of RF switching pulse created by head drum PG.
54	GND	–	IC ground terminal.
55	GND	–	Not used (grounded)
56	–	–	Not used
57	GND	–	IC ground terminal.
58	X1	–	IC clock OSC terminal. Clock frequency is 4 MHz.
59	X2	–	
60	$\overline{\text{RESET}}$	I	Initial reset terminal for IC. Reset when "LOW".
61	0/1 DATA	I	CTL head recording/playback pulse signal input. Used for VISS data detection.
62	ATR $\overline{\text{ON}}$/OFF	I	Auto tracking operation ON/OFF indication signal input. ATR ON when LOW.
63	ENV SW (DOC P.)	I	Video head envelope selection signal input. Used for absorbing (DOC PULSE) STILL noise.
64	–	–	
65	LP HIGH	O	"HIGH" output when tape speed is set to LP mode.
66	LP V • MUTE	O	"HIGH" video mute signal output when tape speed in set to LP mode.
67	–	–	
68	–	–	
69	ML-M	O	Loading motor rotational speed (medium speed) indication signal.
70	ML-L	O	Loading motor rotational speed (low speed) indication signal.
71	ML-R	O	Loading motor rotational direction (REV) indication signal.
72	ML-F	O	Loading motor rotational direction (FWD) indication signal.
73	GND	–	IC ground terminal.
74	JPN/US/PAL	I	Terminal to alter internal specifications for destination areas. (0V input for SP only models, 0.6V input for SP/LP models.)
75	TAPE SPEED	I	Input of result of tape speed determination by digital servo IC.
76	OEM OPTION	I	Terminal to alter internal specifications. (0V input)
77	Hi-Fi ENV	I	AF head envelope detection signal input. (Used for ATR of Hi-Fi models)
78	ENV	I	Video head envelope detection signal input. (Used for ATR)
79	DEW S.	I	Dew sensor input terminal.
80	$\overline{\text{TAPE TOP S.}}$	I	Sensor signal input for tape beginning detection.

P75516-0

IC351 (LC7418) DIGITAL SERVO IC PIN FUNCTIONS TABLE

Pin No.	I/O Terminal Name	I/O	Input/Output Function
1	ROTARY	O	Outputs the head switching control signal for 4-head and 3-head models.
2	H-AMP-SW	O	
3	RF-SW-PULSE	O	Video head switching pulse output.
4	AF-SW-PULSE	O	Audio head (FM) switching pulse output.
5	DL1	I	Dummy V_D insertion position control CR.
6	DL2	I	Dummy V_D insertion position control terminal.
7	CTL-IN	I	Control signal input.
8	REMAK	O	Outputs the control signal re-recording control signal. Three-value output (H, M, L).
9	REC-CTL	O	Recording control signal output. Three-value output (H, OPEN, L).
10	D-P	O	Outputs the drum compensation pulse in the slow mode.
11	D-PG. MM	I	CR for drum PG signal delay.
12	D-PG	I	Drum PG signal input.
13	D-FG	I	Drum FG signal input.
14	DSE	O	Outputs the speed error for drum system speed control. An output making the drum motor stop is delivered when DRUM-ON is "0". The lower three bits of the output data forms R-2R ladder network and the 4th bits for DAC (D/A Converter) and upper 5th to 8th bits for PWM (Pulse Width Modulation).
15	FHE	O	Outputs the horizontal sync signal of the composite sync signal after F-V conversion (using the drum phase control system). The lower three bits of the output data forms R-2R ladder network and the 4th bits for DAC (D/A Converter) and upper 5th to 8th bits for PWM (Pulse Width Modulation).
16	DPE		Error output for drum system phase control. The lower three bits of the output data forms R-2R ladder network and the 4th bits for DAC (D/A Converter) and upper 5th to 8th bits for PWM (Pulse Width Modulation).
17	C-P	O	Outputs the capstan compensation pulse in the slow mode.
18	C-START/STP	O	Outputs the capstan motor start and brake pulses in the slow mode.
19	V_{DD}		+ 5V ± 10 %
20	CSE	O	Capstan system speed error output. An output making the capstan motor stop is delivered when CAP-ON is "0". The lower three bits of the output data forms R-2R ladder network and the 4th bits for DAC (D/A Converter) and upper 5th to 8th bits for PWM (Pulse Width Modulation).
21	CPE	O	Capstan system phase reciprocal error output. The lower three bits of the output data forms R-2R ladder network and the 4th bits for DAC (D/A Converter) and upper 5th to 8th bits for PWM (Pulse Width Modulation).
22	$\overline{\text{F}}$/R	O	Capstan motor forward/reverse control output. "1" sets the reverse mode, and "0" the forward mode.
23	C-FG1	I	Capstan FG signal input.
24	C-FG2	I	2nd capstan FG signal input. Used for stop detection in the intermittent slow mode.
25	EP/LP/SP	O	Recording mode output. Three-value output ("H" is for EP mode, "M" for LP mode and "L" for SP mode).
26	$\overline{\text{SP}}$	O	Recording mode output. "L" is for SP mode.
27	SP	O	Recording mode output. "H" is for SP mode.
28	MC-BR	I	Control input for capstan brake timing.
29	SLOW-TRK-CR	I	CR for slow tracking adjustment.
30	TRK-CR	I	CR for tracking adjustment.
31	D-PH	I	CR for drum compensation timing adjustment in the slow mode.
32	D-WD1	I	
33	D-WD2	I	
34	REF-TRK	O	Outputs the tracking delay input signal.
35	SLOW/STILL	O	Internal mode signal output. "H" in the slow mode.
36	MODE (× 2+STILL)	O	Mode decoding signal output. At the × 2 SPEED mode and starting time of SLOW/STILL mode, output "H" level.
37	INDEX-CLK	O	Outputs the timing for the control signal duty detector.
38	INDEX-DATA	O	Outputs the control signal duty detection results.
39	SV-S • CLK	I	Serial transmission clock pulse input.
40	SV-S • DATA	I	Serial data input terminal.
41	NTSC/$\overline{\text{PAL}}$	I	NTSC/PAL switching input. "H" is for NTSC, "L" for PAL.
42	REF	O	Outputs the internal reference signal.
43	V_{DD}		+ 5V supply terminal
44	FSC IN	I	Input for the IC internal system clock pulse. A level of at least 0.3 Vp-p is required. The color subcarrier signal is input by capacitive coupling.
45	V_{SS}		Ground
46	C-SYNC	I	Composite sync signal input.
47	ENV SW	I	Head selection signal (PB envelope detection signal) input for 4-head special playback.
48	VD	O	Dummy V_D signal output.

LC7418

IC711 (M50959) TIMER MPU PIN FUNCTIONS TABLE

Pin No.	Port	Input/Output Signal	I/O	Input/Output Function
1	Vcc			+5V
2	P6$_5$	TXD	O	DATA signal output to VIDEO TEXT (TELETEXT) MPU.
3	P6$_4$	RXD	I	DATA signal input from VIDEO TEXT (TELETEXT) MPU.
4	P6$_3$	PLL CLK	O	Signal input/output of CLOCK, DATA, CE (chip enable) for PLL tuning system IC.
5	P6$_2$	PLL DATA	I/O	
6	P6$_1$	PLL CE	O	
7	P6$_0$/T	ADJUST	O	Pulse output (32.768kHz/1024 = 32Hz) for clock frequency adjustment.
8	P2$_7$	$\overline{\text{CLK}}$	O	Clock pulse output to the E^2 PROM.
9	P2$_6$	DI	I/O	Data exchange with the E^2 PROM.
10	P2$_5$	$\overline{\text{E}^2\text{ PROM CS1}}$	O	E^2 PROM 1 is accessed when "L".
11	P2$_4$	$\overline{\text{BG}}$/L	O	Transmission system switching ("L" = PAL BG ; "H" = SECAM L).
12	P2$_3$	VIDEO MUTE	O	"H" output during VIDEO MUTE.
13	P2$_2$	TUNER ON	O	"H" output when power is ON and during VPS scanning.
14	P2$_1$	$\overline{\text{AUDIO MUTE}}$	O	"L" output during AUDIO MUTE.
15	P2$_0$	TEXT CLK	O	CLOCK signal output to VIDEO-TEXT (TELETEXT) MPU.
16	P3$_7$/$\overline{\text{Srdy}}$		–	
17	P3$_6$/CLK	$\overline{\text{S.CLK}}$	I	SSB clock pulse input.
18	P3$_5$/Sout	$\overline{\text{S.OUT}}$	O	SSB data output.
19	P3$_4$/Sin	S.IN	I	SSB data input.
20	P3$_3$/ANin	AFT.C	I	AFT.S curve input.
21	P3$_2$/CNTR	H.SYNC	I	Sync. detection signal input for existing channel discrimination. ("L" = Existing Sync.)
22	P3$_1$	SCL	O	Clock pulse output to the VPS decoder IC.
23	P3$_0$	SDA	I/O	Data exchange with the VPS decoder IC.
24	P5$_3$/INT$_1$	$\overline{\text{POWER DOWN}}$	I	Power failure mode set at "L" input.
25	P5$_2$/INT$_2$	IR SIG. IN	I	Remote control signal input.
26	CNVss			Ground.
27	$\overline{\text{RESET}}$			Reset terminal.
28	Xin			6MHz clock terminal.
29	Xout			
30	Xcin			32.768kHz (clock OSC used in the power failure mode)
31	Xcout			
32	Vss			Ground
33	ϕ			
34	P5$_7$	KEY IN4	I	Key inputs
35	P5$_6$	KEY IN3	I	
36	P5$_5$	KEY IN2	I	
37	P5$_4$	KEY IN1	I	
38	Vp	Vp		-30V
39	P5$_1$	STEREO R	O	2-bit signal output for AUDIO OUTPUT SELECT and audio output display indication according to table below.
40	P5$_0$	STEREO L	O	
41	P1$_7$	o	O	Display segment outputs. (Included key-scan output)
42	P1$_6$	n	O	
43	P1$_5$	m	O	
44	P1$_4$	l	O	
45	P1$_3$	k	O	
46	P1$_2$	j	O	
47	P1$_1$	i	O	
48	P1$_0$	G9	O	Display grid outputs.
49	P0$_7$	G8	O	
50	P0$_6$	G7	O	
51	P0$_5$	G6	O	
52	P0$_4$	G5	O	
53	P0$_3$	G4	O	
54	P0$_2$	G3	O	
55	P0$_1$	G2	O	
56	P0$_0$	G1	O	
57	P4$_7$	h	O	Display segment outputs. (Included key-scan output)
58	P4$_6$	g	O	
59	P4$_5$	f	O	
60	P4$_4$	e	O	
61	P4$_3$	d	O	
62	P4$_2$	c	O	
63	P4$_1$	b	O	
64	P4$_0$	a	O	

NOTE : Clock frequency check with ADJUST terminal of Pin 7.

1. Connect the anode of the diode (IS188 etc.) to Pin 44 (key-scan l) and the cathode to Pin 37 (KEY IN 1). Then ground the Pin 27 ($\overline{\text{RESET}}$) terminal once and reset the microcomputer.
2. The clock frequency (32 Hz) can be observed with the ADJUST terminal of Pin 7 according to the servicing above.
3. In order to set normal function mode again, ground the terminal of Pin 27 ($\overline{\text{RESET}}$) once and reset the microcomputer after removing the diode connected to Pins 44 and 37.

PORT \ MODE	NORMAL	MAIN	SUB	STEREO
STEREO R (Pin 39)	L	L	H	H
STEREO L (Pin 40)	L	H	L	H

P50959F0

IC711 (M50958) TIMER MPU PIN FUNCTIONS TABLE (VHR-7500EX)

Pin No.	Port	Input/Output Signal	I/O	Input/Output Function
1	Vcc			+5V
2	P6$_5$	$\overline{\text{I}}$/BG	O	PAL transmission system switching ("L" = PAL I ; "H" = PAL BG)
3	P6$_4$		–	
4	P6$_3$/PWM3	BAND1	O	Band data output (BAND1, BAND2) (L, L) = VHF-LOW (L, H) = VHF-HIGH (H, L) = UHF (H, H) = SKIP
5	P6$_2$/PWM2	BAND2	O	
6	P6$_1$/PWM1	PWM	O	Tuning voltage output. (PWM signal)
7	P6$_0$/T	ADJUST	O	Pulse output (32.768kHz/1024 = 32Hz) for clock frequency adjustment.
8	P2$_7$	$\overline{\text{CLK}}$	O	Clock pulse output to the E^2 PROM.
9	P2$_6$	DI	I/O	Data exchange with the E^2 PROM.
10	P2$_5$	$\overline{\text{E}^2\text{ PROM CS1}}$	O	E^2 PROM 1 is accessed when "L".
11	P2$_4$	$\overline{\text{PAL}}$/SECAM	O	Transmission system switching ("L" = PAL ; "H" = SECAM).
12	P2$_3$	VIDEO MUTE	O	"H" output during VIDEO MUTE
13	P2$_2$	TUNER ON	O	"H" output when tuner power is ON.
14	P2$_1$	$\overline{\text{AUDIO MUTE}}$	O	"L" output during AUDIO MUTE.
15	P2$_0$	AFT MUTE	O	"H" output during AFT MUTE.
16	P3$_7$/$\overline{\text{Srdy}}$	$\overline{\text{CH +}}$	O	CH + system switching ("L" = CH + ON)
17	P3$_6$/CLK	$\overline{\text{S.CLK}}$	I	SSB clock pulse input.
18	P3$_5$/Sout	$\overline{\text{S.OUT}}$	O	SSB data output.
19	P3$_4$/Sin	S.IN	I	SSB data input.
20	P3$_3$/ANin	AFT.C	I	AFT.S curve input.
21	P3$_2$/CNTR	H.SYNC	I	Sync. detection signal input for existing channel discrimination. ("L" = Existing Sync.)
22	P3$_1$	SCL	O	Clock pulse output to the VPS decoder IC.
23	P3$_0$	SDA	I/O	Data exchange with the VPS decoder IC.
24	P5$_3$/INT$_1$	$\overline{\text{POWER DOWN}}$	I	Power failure mode set at "L" input.
25	P5$_2$/INT$_2$	IR SIG. IN	I	Remote control signal input.
26	CNVss			Ground.
27	$\overline{\text{RESET}}$			Reset terminal.
28	Xin			6MHz clock terminal.
29	Xout			
30	Xcin			32.768kHz (clock OSC used in the power failure mode)
31	Xcout			
32	Vss			Ground
33	ϕ			
34	P5$_7$	KEY IN4	I	Key inputs
35	P5$_6$	KEY IN3	I	
36	P5$_5$	KEY IN2	I	
37	P5$_4$	KEY IN1	I	
38	Vp	Vp		-30V
39	P5$_1$	STEREO R	O	2-bit signal output for AUDIO OUTPUT SELECT and audio output display indication according to table below.
40	P5$_0$	STEREO L	O	
41	P1$_7$	o	O	Display segment outputs. (Included key-scan output)
42	P1$_6$	n	O	
43	P1$_5$	m	O	
44	P1$_4$	l	O	
45	P1$_3$	k	O	
46	P1$_2$	j	O	
47	P1$_1$	i	O	
48	P1$_0$	G9	O	Display grid outputs.
49	P0$_7$	G8	O	
50	P0$_6$	G7	O	
51	P0$_5$	G6	O	
52	P0$_4$	G5	O	
53	P0$_3$	G4	O	
54	P0$_2$	G3	O	
55	P0$_1$	G2	O	
56	P0$_0$	G1	O	
57	P4$_7$	h	O	Display segment outputs. (Included key-scan output)
58	P4$_6$	g	O	
59	P4$_5$	f	O	
60	P4$_4$	e	O	
61	P4$_3$	d	O	
62	P4$_2$	c	O	
63	P4$_1$	b	O	
64	P4$_0$	a	O	

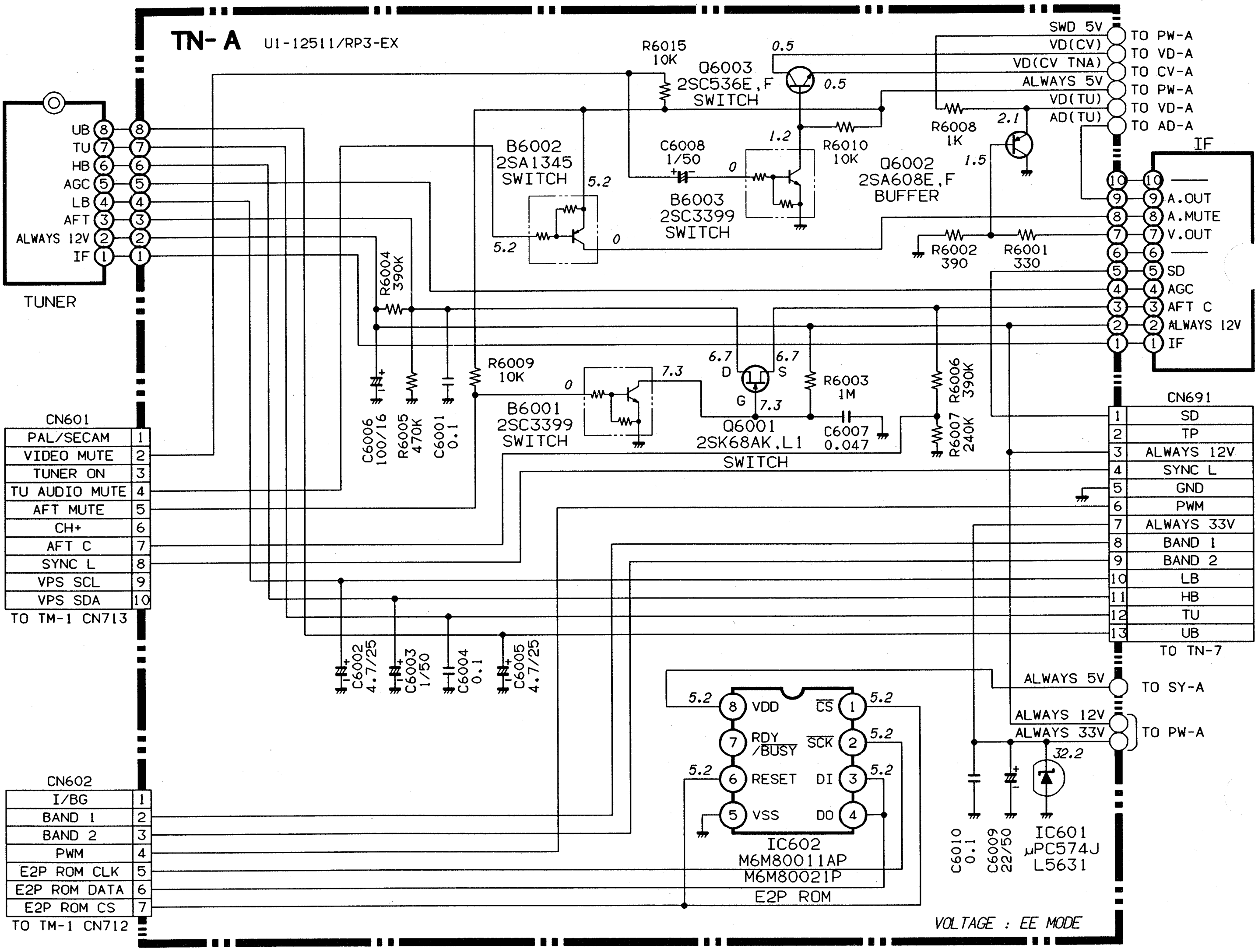
NOTE : Clock frequency check with ADJUST terminal of Pin 7.

1. Connect the anode of the diode (IS188 etc.) to Pin 44 (key-scan l) and the cathode to Pin 37 (KEY IN 1). Then ground the Pin 27 ($\overline{\text{RESET}}$) terminal once and reset the microcomputer.
2. The clock frequency (32 Hz) can be observed with the ADJUST terminal of Pin 7 according to the servicing above.
3. In order to set normal function mode again, ground the terminal of Pin 27 ($\overline{\text{RESET}}$) once and reset the microcomputer after removing the diode connected to Pins 44 and 37.

PORT \ MODE	NORMAL	MAIN	SUB	STEREO
STEREO R (Pin 39)	L	L	H	H
STEREO L (Pin 40)	L	H	L	H

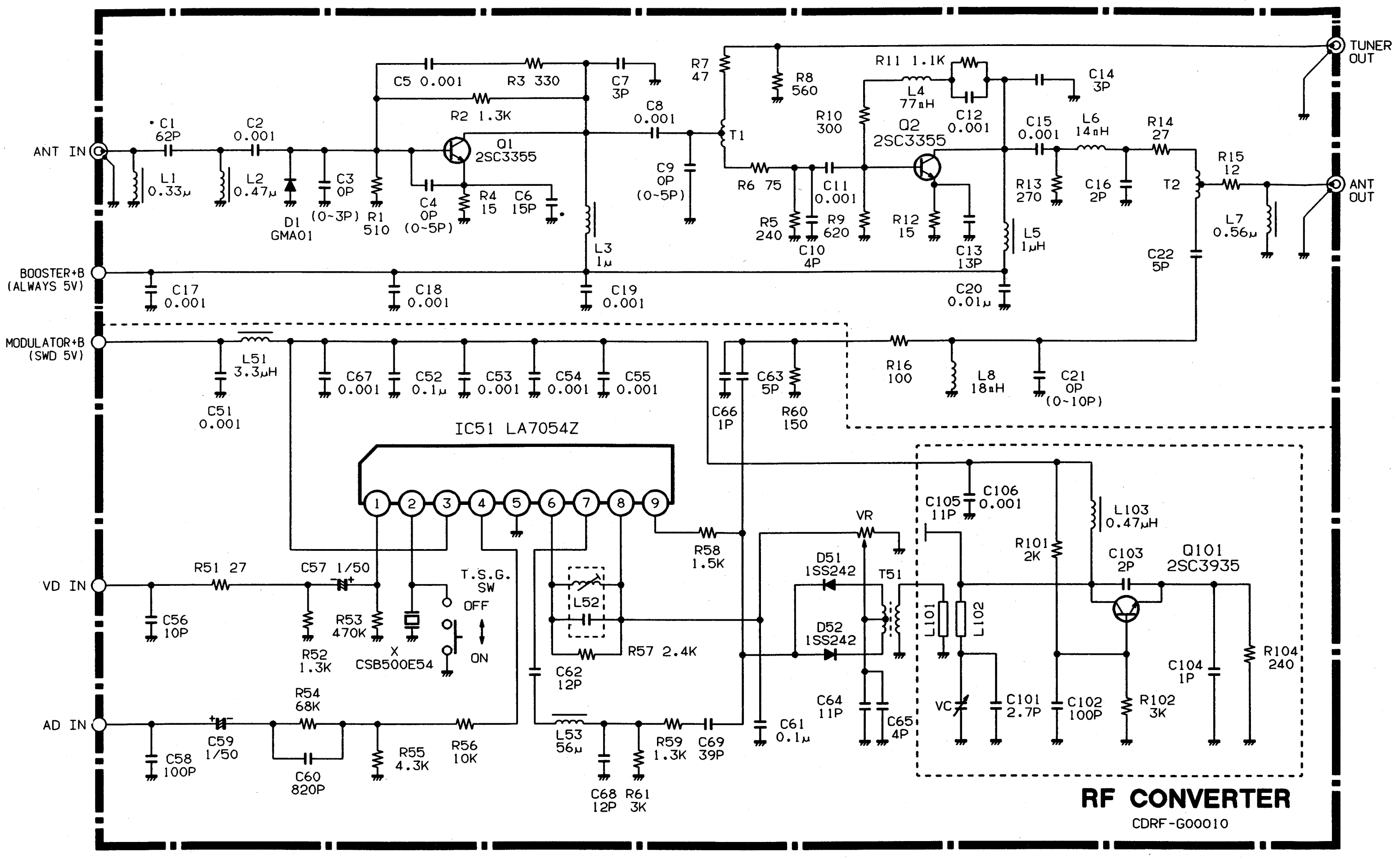
P50958V0

CP-1 BOARD (TN-A) TUNER IF CONNECTION CIRCUIT DIAGRAM (VHR-7500EX)

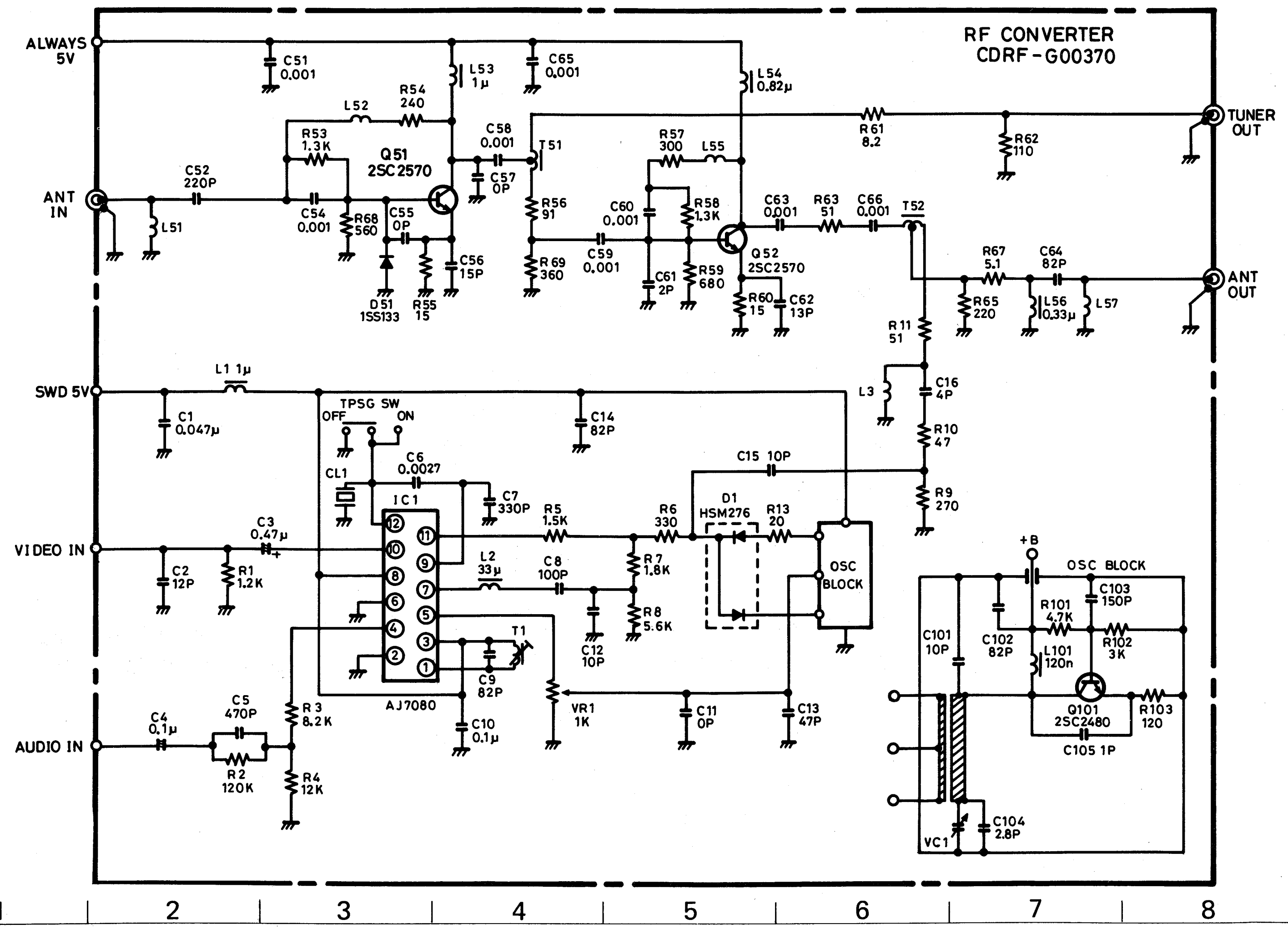


TN- A
U1-12511/RP3-EX
TUNER
UB 8
TU 7
HB 6
AGC 5
LB 4
AFT 3
ALWAYS 12V 2
IF 1
R6015
10K
Q6003
2SC536E,F
SWITCH
0.5
0.5
B6002
2SA1345
SWITCH
5.2
5.2
0
C6008
1/50
0
1.2
B6003
2SC3399
SWITCH
R6010
10K
Q6002
2SA608E,F
BUFFER
R6008
1K
2.1
1.5
R6002
390
R6001
330
SWD 5V
VD(CV)
VD(CV TNA)
ALWAYS 5V
VD(TU)
AD(TU)
TO PW-A
TO VD-A
TO CV-A
TO PW-A
TO VD-A
TO AD-A
IF
10 ——
9 A.OUT
8 A.MUTE
7 V.OUT
6 ——
5 SD
4 AGC
3 AFT C
2 ALWAYS 12V
1 IF
R6004
390K
C6006
100/16
R6005
470K
C6001
0.1
R6009
10K
0
B6001
2SC3399
SWITCH
7.3
6.7
D
6.7
S
G
7.3
Q6001
2SK68AK,L1
SWITCH
R6003
1M
C6007
0.047
R6006
390K
R6007
240K
CN601
1 PAL/SECAM
2 VIDEO MUTE
3 TUNER ON
4 TU AUDIO MUTE
5 AFT MUTE
6 CH+
7 AFT C
8 SYNC L
9 VPS SCL
10 VPS SDA
TO TM-1 CN713
CN691
1 SD
2 TP
3 ALWAYS 12V
4 SYNC L
5 GND
6 PWM
7 ALWAYS 33V
8 BAND 1
9 BAND 2
10 LB
11 HB
12 TU
13 UB
TO TN-7
C6002
4.7/25
C6003
1/50
C6004
0.1
C6005
4.7/25
ALWAYS 5V
TO SY-A
ALWAYS 12V
ALWAYS 33V
TO PW-A
5.2
8 VDD
7 RDY /BUSY
5.2
6 RESET
5 VSS
CS 1
5.2
SCK 2
5.2
DI 3
5.2
DO 4
IC602
M6M80011AP
M6M80021P
E2P ROM
32.2
C6010
0.1
C6009
22/50
IC601
μPC574J
L5631
CN602
1 I/BG
2 BAND 1
3 BAND 2
4 PWM
5 E2P ROM CLK
6 E2P ROM DATA
7 E2P ROM CS
TO TM-1 CN712
VOLTAGE : EE MODE

RF CONVERTER CIRCUIT DIAGRAM

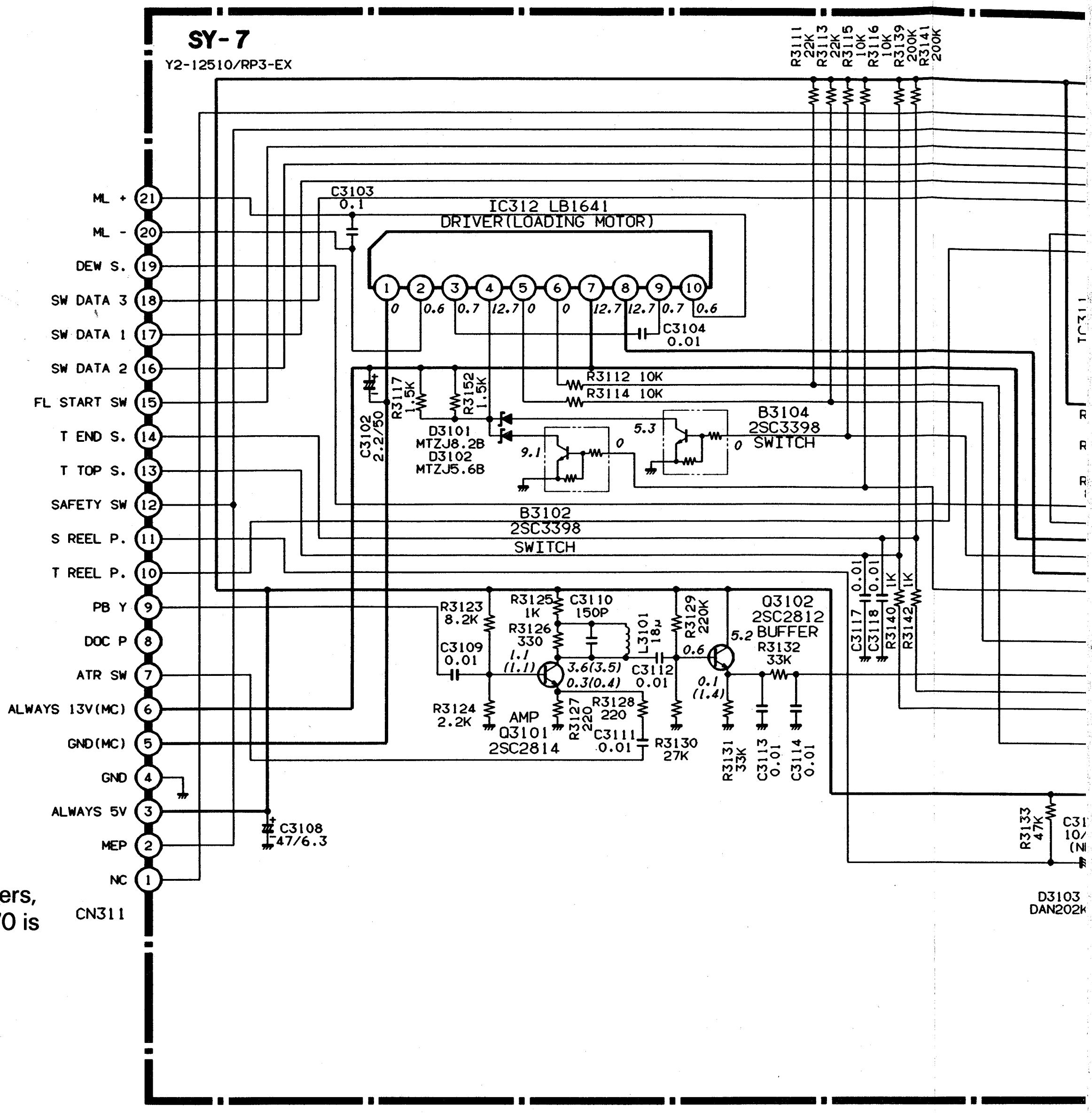

ANT IN
BOOSTER+B (ALWAYS 5V)
MODULATOR+B (SWD 5V)
VD IN
AD IN
TUNER OUT
ANT OUT
Q1 2SC3355
Q2 2SC3355
D1 GMA01
IC51 LA7054Z
T.S.G. SW
OFF
ON
X CSB500E54
D51 1SS242
D52 1SS242
T51
VR
VC
Q101 2SC3935
L103 0.47μH
RF CONVERTER
CDRF-G00010

RF CONVERTER CIRCUIT DIAGRAM

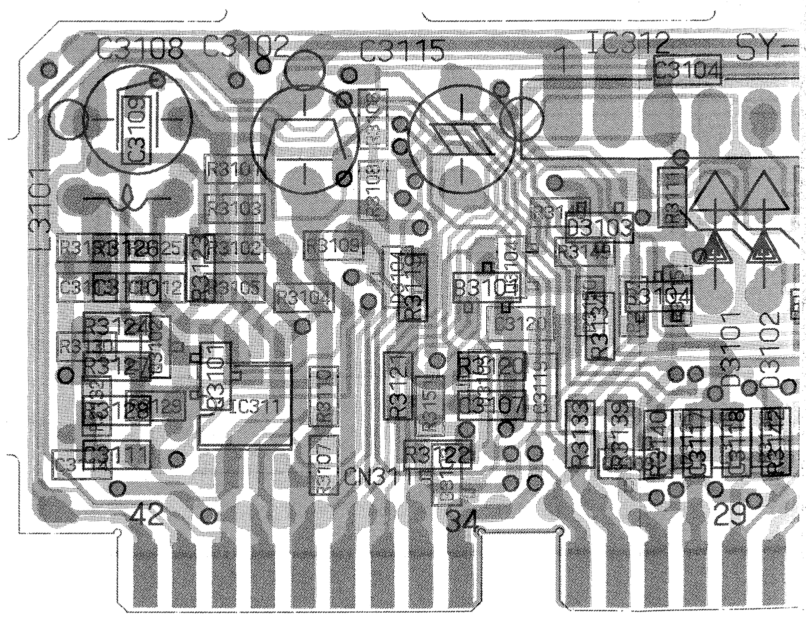

ALWAYS 5V
ANT IN
SWD 5V
VIDEO IN
AUDIO IN
TUNER OUT
ANT OUT
RF CONVERTER
CDRF-G00370
Q51 2SC2570
Q52 2SC2570
D51 1SS133
TPSG SW
OFF
ON
CL1
IC1
AJ7080
D1 HSM276
OSC BLOCK
VR1 1K
T1
Q101 2SC2480
VC1
+B

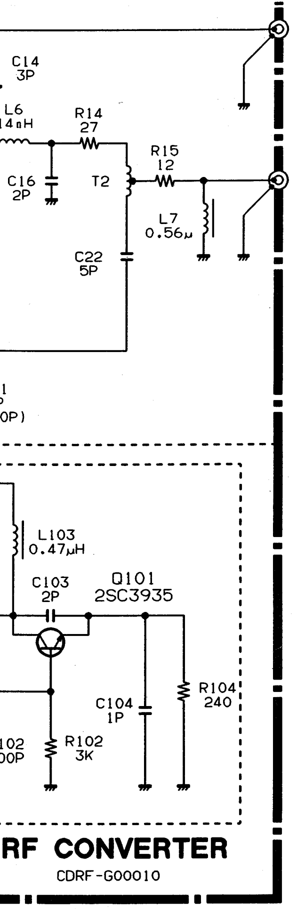
Note: Either one of these RF converters, type CDRF-G00010 or CDRF-G00370 is used, depending on availability.

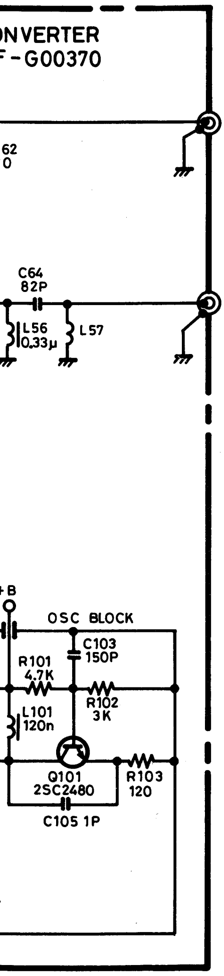
SY-7 BOARD LOADING MOTOR DRIVER & SENSOR


SY-7
Y2-12510/RP3-EX
IC312 LB1641
DRIVER(LOADING MOTOR)
CN311
ML +
ML -
DEW S.
SW DATA 3
SW DATA 1
SW DATA 2
FL START SW
T END S.
T TOP S.
SAFETY SW
S REEL P.
T REEL P.
PB Y
DOC P
ATR SW
ALWAYS 13V(MC)
GND(MC)
GND
ALWAYS 5V
MEP
NC
B3104 2SC3398 SWITCH
B3102 2SC3398 SWITCH
D3101 MTZJ8.2B
D3102 MTZJ5.6B
Q3101 2SC2814
AMP
Q3102 2SC2812
BUFFER
D3103 DAN202K

SY-7 P.C.B.

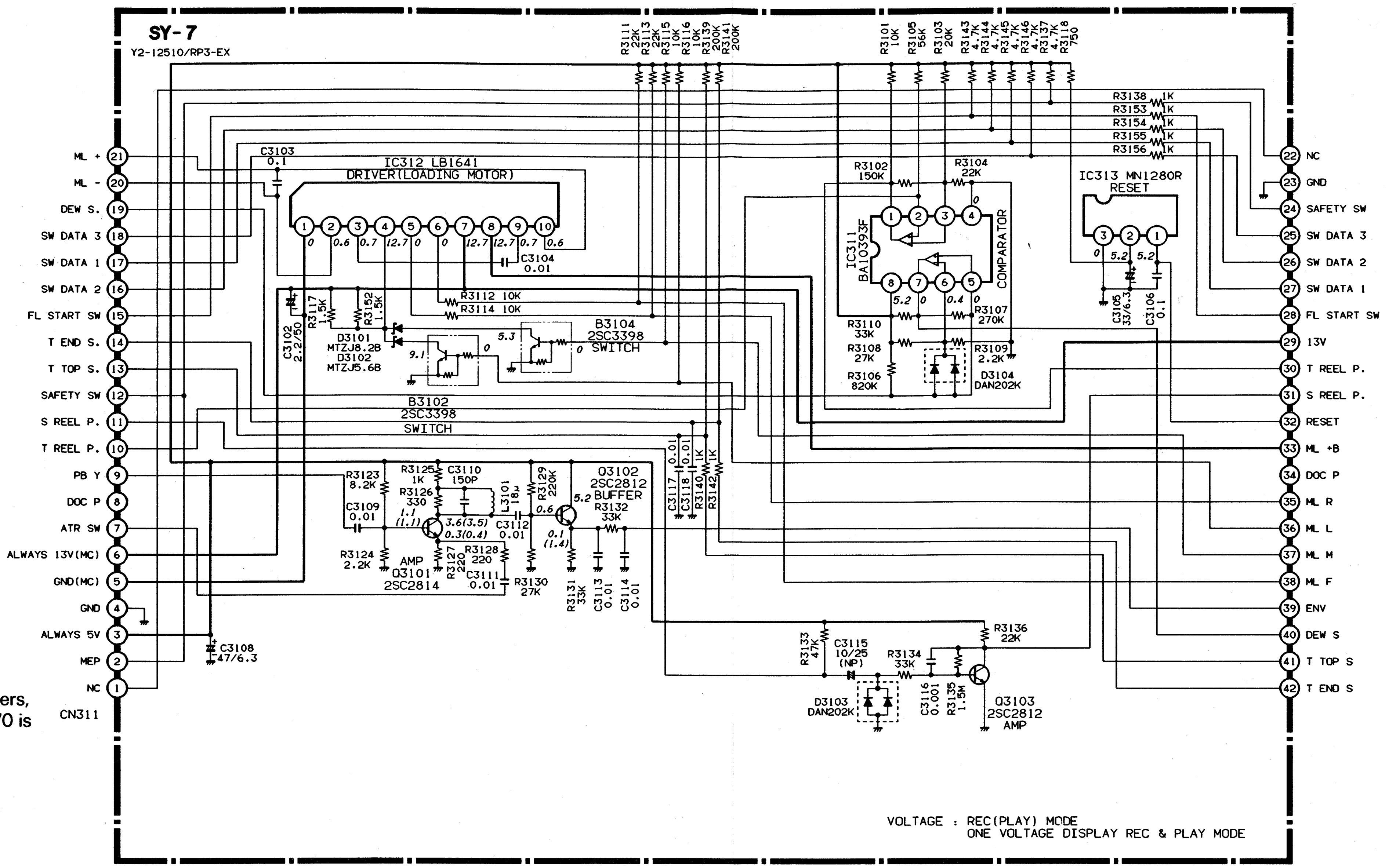

IC312
SY-
C3108
C3102
C3115
C3104
C3109
L3101
CN311
42
34
29


TUNER OUT
C14 3P
L6
R14 27
R15 12
C16 2P
T2
L7 0.56µ
ANT OUT
C22 5P
L103 0.47µH
C103 2P
Q101 2SC3935
C104 1P
R104 240
R102 3K
RF CONVERTER
CDRF-G00010

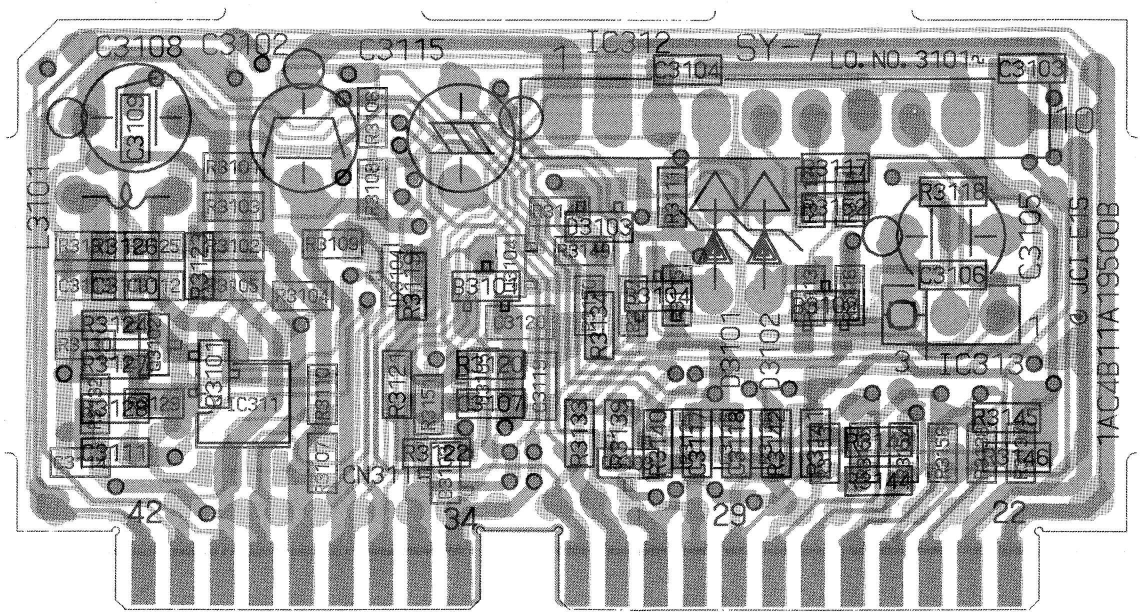

CONVERTER
F-G00370
TUNER OUT
C64 82P
L56 0.33µ
L57
ANT OUT
OSC BLOCK
C103 150P
R101 4.7K
R102 3K
L101 120n
Q101 2SC2480
R103 120
C105 1P

Note: Either one of these RF converters, type CDRF-G00010 or CDRF-G00370 is used, depending on availability.

SY-7 BOARD LOADING MOTOR DRIVER & SENSOR INPUT CIRCUIT DIAGRAM


SY-7
Y2-12510/RP3-EX
IC312 LB1641
DRIVER(LOADING MOTOR)
IC311 BA10393F COMPARATOR
IC313 MN1280R RESET
B3102 2SC3398 SWITCH
B3104 2SC3398 SWITCH
Q3101 2SC2814 AMP
Q3102 2SC2812 BUFFER
Q3103 2SC2812 AMP
D3101 MTZJ8.2B
D3102 MTZJ5.6B
D3103 DAN202K
D3104 DAN202K
CN311
ML +
ML -
DEW S.
SW DATA 3
SW DATA 1
SW DATA 2
FL START SW
T END S.
T TOP S.
SAFETY SW
S REEL P.
T REEL P.
PB Y
DOC P
ATR SW
ALWAYS 13V(MC)
GND(MC)
GND
ALWAYS 5V
MEP
NC
NC
GND
SAFETY SW
SW DATA 3
SW DATA 2
SW DATA 1
FL START SW
13V
T REEL P.
S REEL P.
RESET
ML +B
DOC P
ML R
ML L
ML M
ML F
ENV
DEW S
T TOP S
T END S
VOLTAGE : REC(PLAY) MODE
ONE VOLTAGE DISPLAY REC & PLAY MODE

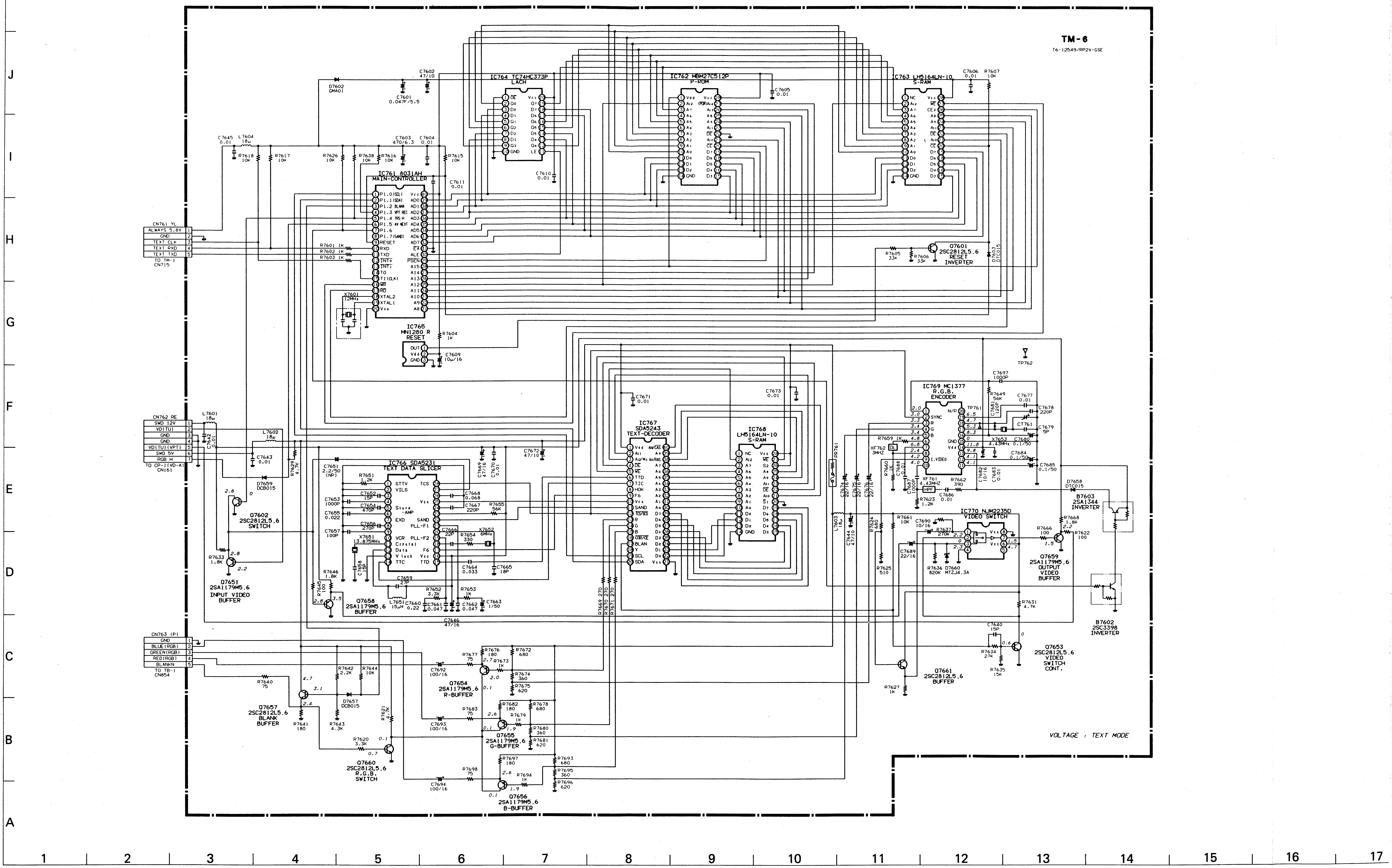
SY-7 P.C.B.


C3108 C3102 C3115
IC312 SY-7 LO. NO. 3101
C3104 C3103
1 10
L3101
IC313
42 34 29 22
CN311
1AC4B11A19500B

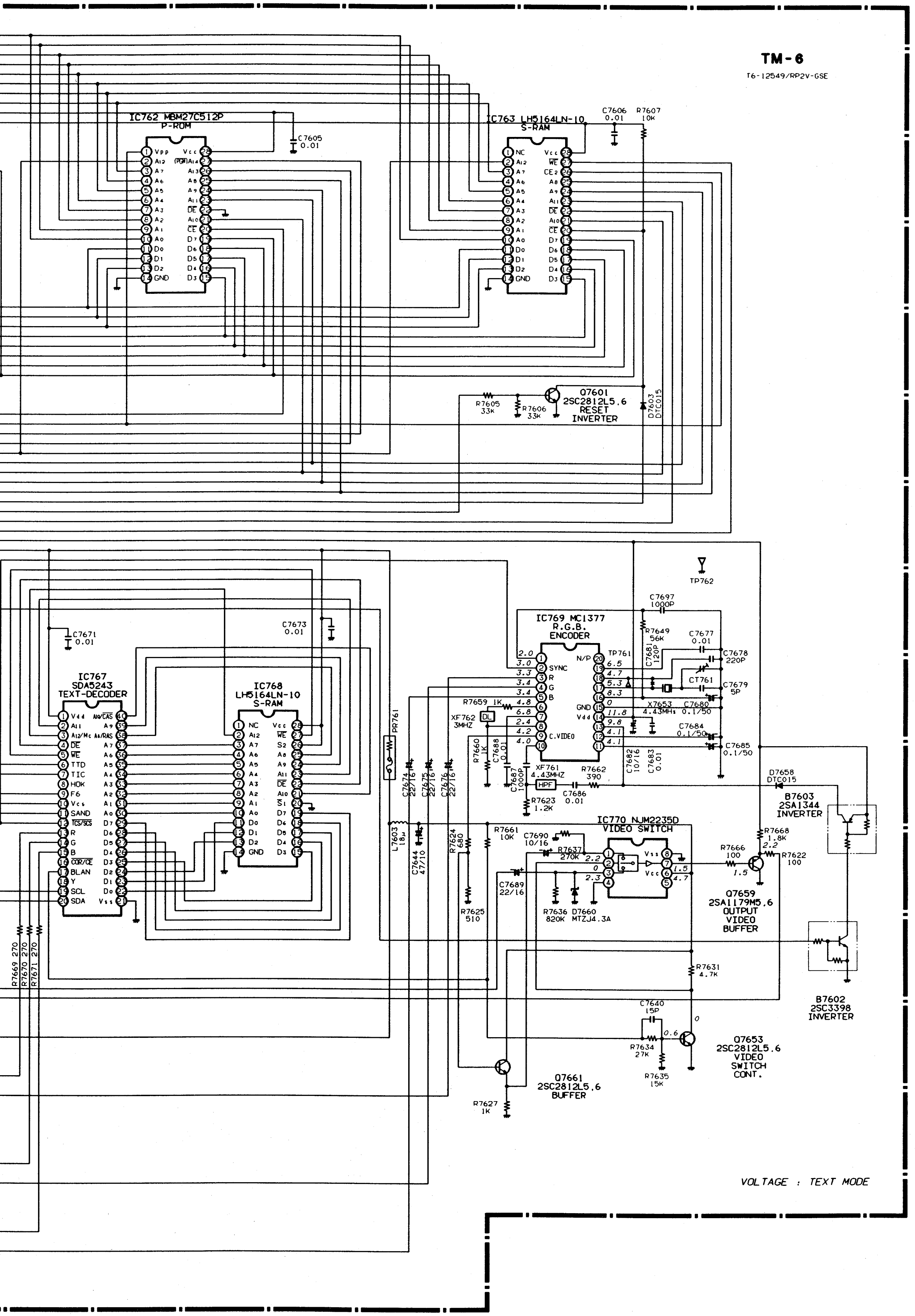
▨ **BOTTOM SIDE FOIL**
▨ **TOP SIDE FOIL**

7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23

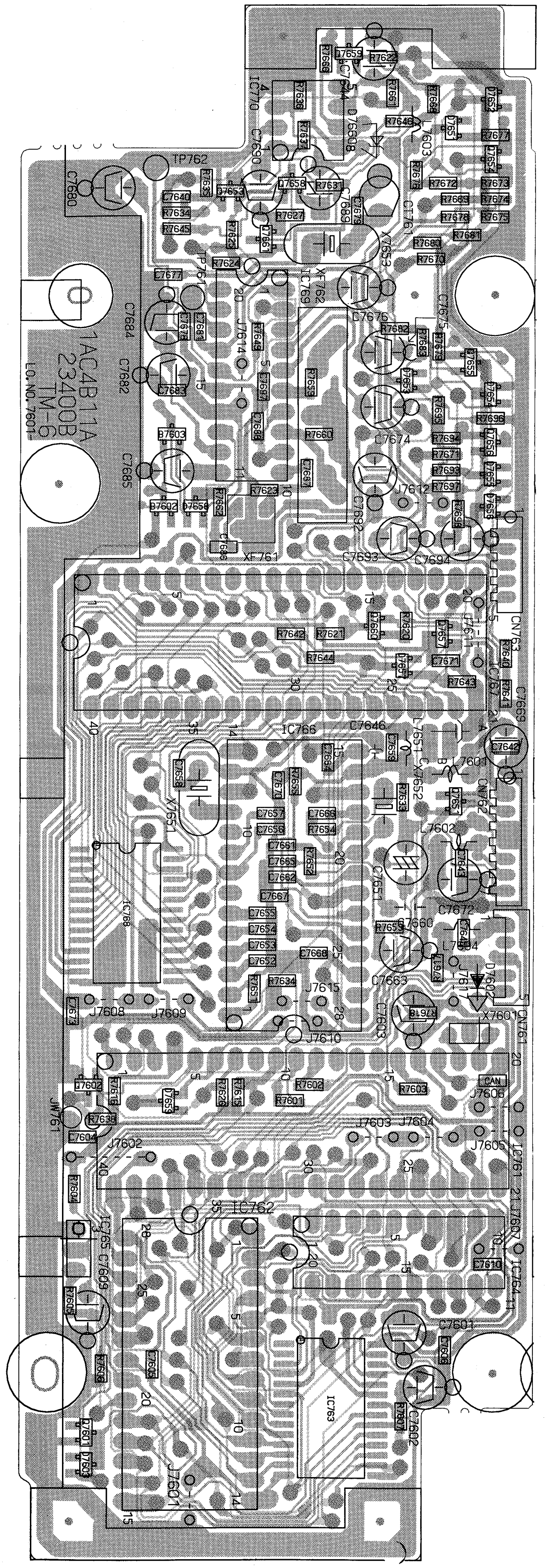
TM-6 BOARD VIDEO TEXT DECODER (VPT) CIRCUIT DIAGRAM (VHR-7540G)


TM-6
T6-12549/RP2V-GSE
IC761 8031AH MAIN-CONTROLLER
IC762 MBM27C512P P-ROM
IC763 LH5164LN-10 S-RAM
IC764 TC74HC373P LACH
IC765 MN1280 R RESET
IC766 SDA5231 TEXT DATA SLICER
IC767 SDA5243 TEXT-DECODER
IC768 LH5164LN-10 S-RAM
IC769 MC1377 R.G.B. ENCODER
IC770 NJM2235D VIDEO SWITCH
Q7601 2SC2812L5,6 RESET INVERTER
Q7602 2SC2812L5,6 SWITCH
Q7651 2SA1179M5,6 INPUT VIDEO BUFFER
Q7653 2SC2812L5,6 VIDEO SWITCH CONT.
Q7654 2SA1179M5,6 R-BUFFER
Q7655 2SA1179M5,6 G-BUFFER
Q7656 2SA1179M5,6 B-BUFFER
Q7657 2SC2812L5,6 BLANK BUFFER
Q7658 2SA1179M5,6 BUFFER
Q7659 2SA1179M5,6 OUTPUT VIDEO BUFFER
Q7660 2SC2812L5,6 R.G.B. SWITCH
Q7661 2SC2812L5,6 BUFFER
B7602 2SC3398 INVERTER
B7603 2SA1344 INVERTER
CN761 YL: ALWAYS 5.8V, GND, TEXT CLK, TEXT RXD, TEXT TXD — TO TM-1 CN715
CN762 RE: SWD 12V, VD(TU), GND, GND, VD(TU)(VPT), SWD 5V, RGB H — TO CP-1(VD-A) CN161
CN763 (P): GND, BLUE(RGB), GREEN(RGB), RED(RGB), BLANKN — TO TB-1 CN854
X7601 12MHz
X7651 13.875MHz
X7652 6MHz
X7653 4.43MHz
XF761 4.43MHZ
XF762 3MHZ
D7602 GMA01
D7603 DTC015
D7657 DCB015
D7658 DTC015
D7659 DCB015
D7660 MTZJ4.3A
TP761
TP762
VOLTAGE : TEXT MODE
K
J
I
H
G
F
E
D
C
B
A
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17

DECODER (VPT) CIRCUIT DIAGRAM (VHR-7540G)


TM-6
T6-12549/RP2V-GSE
IC762 MBM27C512P P-ROM
C7605 0.01
IC763 LH5164LN-10 S-RAM
C7606 0.01
R7607 10K
R7605 33K
R7606 33K
Q7601 2SC2812L5,6 RESET INVERTER
D7603 DTC015
TP762
C7697 1000P
IC769 MC1377 R.G.B. ENCODER
R7649 56K
C7677 0.01
C7678 220P
CT761
C7679 5P
X7653 4.43MHz
C7680 0.1/50
C7684 0.1/50
C7685 0.1/50
C7671 0.01
C7673 0.01
IC767 SDA5243 TEXT-DECODER
IC768 LH5164LN-10 S-RAM
PR761
R7659 1K
XF762 3MHZ
R7660 1K
C7687 100P
XF761 4.43MHZ
HPF
R7662 390
C7686 0.01
R7623 1.2K
C7682 10/16
C7683 0.01
D7658 DTC015
B7603 2SA1344 INVERTER
R7668 1.8K
IC770 NJM2235D VIDEO SWITCH
R7661 10K
C7690 10/16
R7637 270K
R7666 100
R7622 100
Q7659 2SA1179M5,6 OUTPUT VIDEO BUFFER
L7603 18μ
C7644 47/10
C7674 22/16
C7675 22/16
C7676 22/16
R7624 680
R7625 510
C7689 22/16
R7636 820K
D7660 MTZJ4.3A
R7631 4.7K
B7602 2SC3398 INVERTER
C7640 15P
R7634 27K
R7635 15K
Q7653 2SC2812L5,6 VIDEO SWITCH CONT.
Q7661 2SC2812L5,6 BUFFER
R7627 1K
R7669 270
R7670 270
R7671 270
VOLTAGE : TEXT MODE

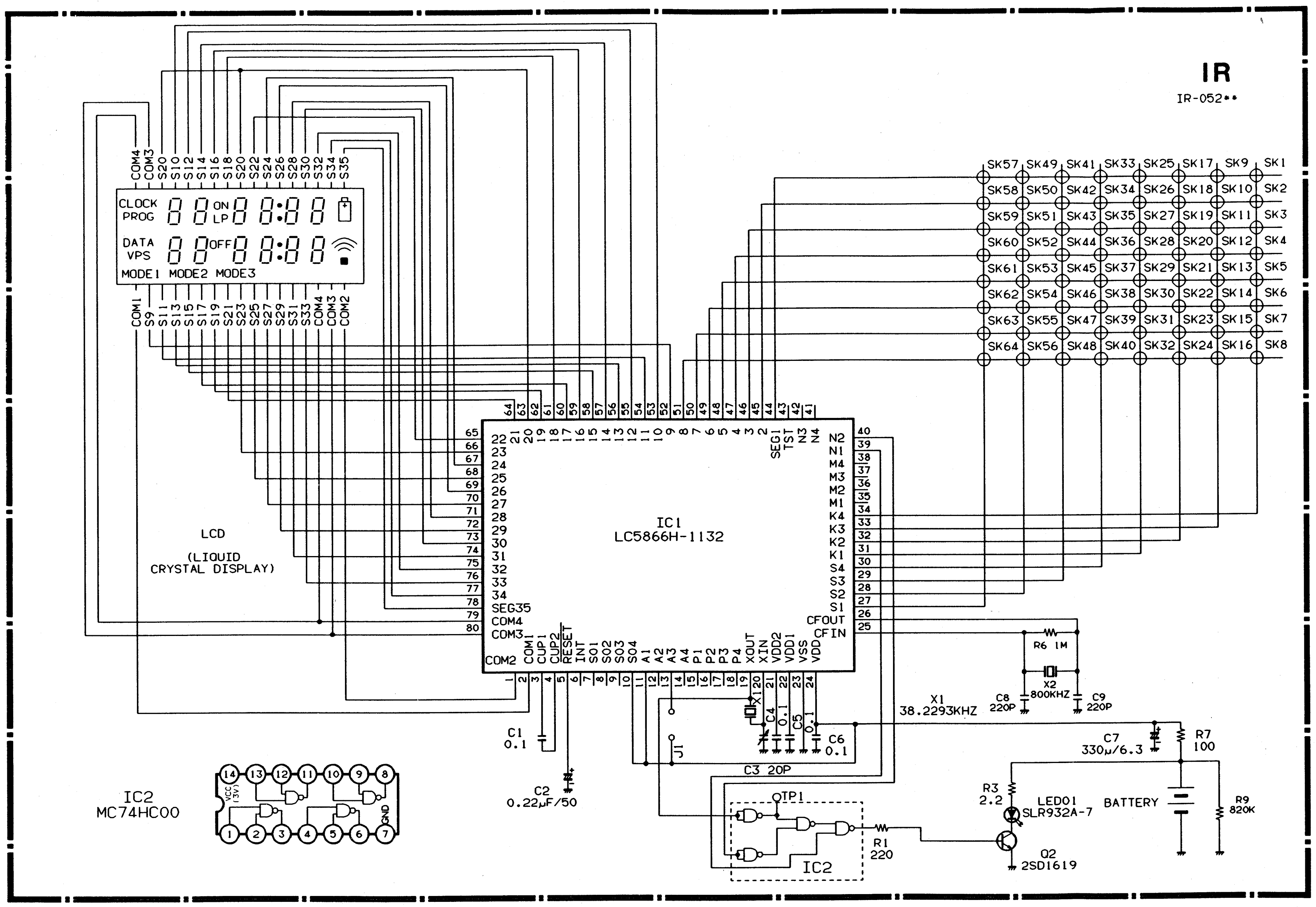
TM-6 P.C.B. (VHR-7540G)


TP762
C7690
1AC4B11A
23400B
TM-6
IC769
XF762
X7653
XF761
IC766
IC768
IC767
IC762
IC763
CN761
CN763
J7601
J7602
J7603
J7604
J7605
J7608
J7609
J7610
J7615
C7601
C7693
C7694

▨ BOTTOM SIDE FOIL
▨ TOP SIDE FOIL

8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24

IR REMOTE CONTROL CIRCUIT DIAGRAM (VHR-7540G)


IR
IR-052••
CLOCK
PROG
DATA
VPS
ON
LP
OFF
MODE1 MODE2 MODE3
LCD
(LIQUID CRYSTAL DISPLAY)
IC1
LC5866H-1132
SK1 SK2 SK3 SK4 SK5 SK6 SK7 SK8
X1
38.2293KHZ
R6 1M
X2
800KHZ
C8 220P
C9 220P
C1 0.1
C2 0.22μF/50
C3 20P
C4 0.1
C5 0.1
C6 0.1
J1
C7 330μ/6.3
R7 100
R3 2.2
LED01 SLR932A-7
BATTERY
R9 820K
IP1
R1 220
IC2
Q2 2SD1619
IC2
MC74HC00
VCC (3V)
GND

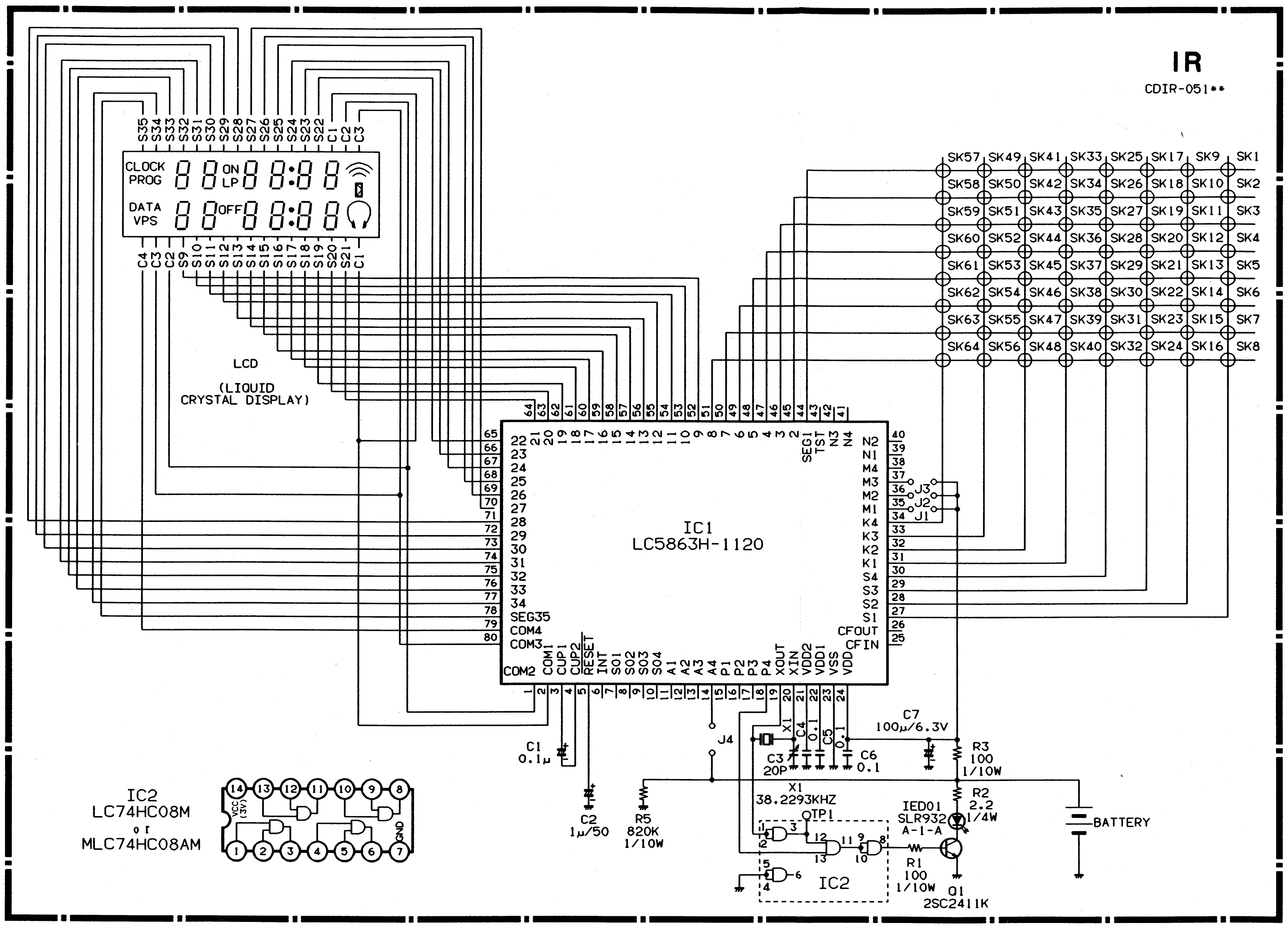
AVAILABLE KEY FUNCTION OF REMOTE CONTROL UNIT

KEY NO.	FUNCTION			
	MODE1		MODE2	
1	TRANS	USE	TRANS	USE
2	CLEAR		CLEAR	
3	VCR/TV		VCR/TV	
4	MODE	USE	MODE	USE
5	POWER	USE	POWER	USE
9	STATUS	USE	STATUS	USE
10	MENU	USE	MENU	USE
11	MONITOR	USE	MONITOR	USE
12	R.PLAY		R.PLAY	
13	SEQ		SEQ	
15	HOLD	USE	HOLD	USE
16	TV	USE	TV	USE
17	SC		A.SEL	
18	3	USE	3	USE
19	2	USE	2	USE
20	1	USE	1	USE
21	SP/LP	USE	SP/LP	USE
25	SPECIAL	USE	BLANK	USE
26	6	USE	6	USE
27	5	USE	5	USE
28	4	USE	4	USE
29	PROG	USE	CLOCK	USE
33	RESET	USE	REMAIN	USE
34	9	USE	9	USE
35	8	USE	8	USE
36	7	USE	7	USE
37	VPS	USE	CHECK	USE

KEY NO.	FUNCTION			
	MODE1		MODE2	
38	TIME	USE	TIME	USE
39	EXP	USE	EXP	USE
40	REVEAL	USE	REVEAL	USE
41	MEMORY	USE	MEMORY	USE
42	⇥	USE	⇥	USE
43	0/AV	USE	0/AV	USE
44	⇤	USE	⇤	USE
45	SEARCH	USE	MARK	USE
46	VPT	USE	VPT	USE
47	TITLE	USE	TITLE	USE
48	TEXT	USE	TEXT	USE
49	FF	USE	FF	USE
50	OK	USE	OK	USE
51	PLAY	USE	PLAY	USE
52	REW	USE	REW	USE
53	TRACK	USE	TRACK	USE
54	CURSOR ↓	USE	CURSOR ↓	USE
55	CURSOR ←	USE	CURSOR ←	USE
56	CANCEL	USE	CANCEL	USE
57	PAUSE/STILL	USE	PAUSE/STILL	USE
58	CURSOR →	USE	CURSOR →	USE
59	STOP	USE	STOP	USE
60	SLOW	USE	A.DUB	
61	REC	USE	INSERT	
62	CURSOR ↑	USE	CURSOR ↑	USE
63	MODE+	USE	MODE+	USE
64	MODE-	USE	MODE-	USE

IR-05204

IR REMOTE CONTROL CIRCUIT DIAGRAM (VHR-7500G, VHR-7500EX, VHR-7530G, VHR-8500SP)


IR
CDIR-051**
CLOCK
PROG
DATA
VPS
ON
LP
OFF
LCD
(LIQUID CRYSTAL DISPLAY)
SK1 … SK64
IC1
LC5863H-1120
SEG35
COM4
COM3
COM2
COM1
CUP1
CUP2
RESET
INT
SO1
SO2
SO3
SO4
A1
A2
A3
A4
P1
P2
P3
P4
XOUT
XIN
VDD2
VDD1
VSS
VDD
CFOUT
CFIN
N1
N2
N3
N4
M1
M2
M3
M4
K1
K2
K3
K4
S1
S2
S3
S4
SEG1
TST
J1
J2
J3
J4
C1
0.1μ
C2
1μ/50
R5
820K
1/10W
X1
38.2293KHZ
C3
20P
C4
0.1
C5
0.1
C6
0.1
C7
100μ/6.3V
TP1
R3
100
1/10W
R2
2.2
1/4W
IED01
SLR932
A-1-A
R1
100
1/10W
Q1
2SC2411K
BATTERY
IC2
LC74HC08M
or
MLC74HC08AM
VCC (3V)
GND

AVAILABLE KEY FUNCTION OF REMOTE CONTROL UNIT

KEY NO.	FUNCTION	
1	PAUSE	USE
2	STOP	USE
3	MODE -	USE
4	REC	USE
5		USE
6	MODE +	USE
7	SEARCH	USE
8	SLOW	USE
9	FF	USE
10	PLAY	USE
11	BLANK	USE
12	REW	USE
13	A.TR	USE
14	C.DISP	USE
15	SPECIAL	USE
16	RESET	USE
17	EJECT	
18	R.PLAY	
19	X2S	
20	A.DUB	
21	INSERT	
22	↓	

KEY NO.	FUNCTION	
23	MARK	USE
24	CNT M	USE
25	CH +	USE
26	0/AV	USE
27	CH -	USE
28	A.SEL	
29	CANCEL	USE
30	←	
31	↑	
32	→	
33	9	USE
34	8	USE
35	7	USE
36	SC	
37	CLOCK	USE
38	SIZE	
39	ART	
40	INST	
41	6	USE
42	5	USE
43	4	USE
44	SP/LP	USE

KEY NO.	FUNCTION	
45	CHECK	USE
46	CHSCAN	
47	OK	
48	M.STILL	
49	3	USE
50	2	USE
51	1	USE
52	VPS	USE *1
53	PROG	USE
54	M.CALL	
55	OSD	
56	ERASE	
57	TRANS	USE
58	ZOOM	
59	MONITOR	USE
60	VCR/TV	
61	POWER	USE
62	PRESET	
63	NR	
64	MUTE	

IR-05122+

NOTE

	*1
VHR-7500G VHR-7530G	USE
VHR-7500EX VHR-8500SP	NOT USE

SANYO

Mechanism Service Technical Information

Color Video Cassette Recorder

P88 MECHANISM

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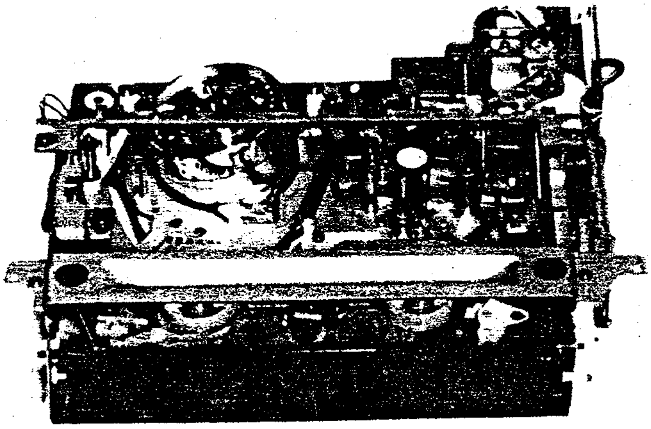
widzie VHR 4100 EE
VHR 5100 EE



VHS HQ
PAL SECAM

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1. OUTLINE OF MECHANISM

This mechanism is named P-88 Mechanism. Its features include:

(1) The chassis is fabricated by drawing a 1.6mm thick electric zinc plated steel sheet, and mechanical parts are ingeniously laid on this chassis. The mechanism is as thick as 70.3 mm, which indicates that it is 86 % thicker than conventional mechanisms hitherto available.

(2) After insertion of a cassette, the tape is normally wound to the head drum based on the full loading system. This design results in the shortening of the mode shift time, that is, the time from the depression of the PLAY pushbutton switch to the video image display on screen has been significantly quickened.

(3) The full loading system employed has the F/R search capability (when the same button (F.FWD or REW) is pressed in the F.FWD or REW modes, the search mode playback image appears on the screen).

(4) Also, a thin type head drum without lead is provided to increase the operating convenience of the equipment to a considerable extent.

(5) The drive source for cassette loading and the motor for the tape loading mode selection are used in combination with the head motor and the capstan motor for realization of a 3-motor system.

1-1. FULL LOADING MECHANISM

I. Quick playback
Mode shift time such as the STOP→PLAY and FF/REW→PLAY has been shortened for quicker playback.

II. High-speed VISS and VASS
The time from the detection of VISS/VASS search signal based on the VHS standardized search system till image display on the screen has considerably been shortened to make high-speed VISS and VASS possible.

(1) Description of full loading mechanism
As shown in Fig. 1-1 ⓐ, ⓑ, a tape has hitherto been wound onto the head drum only in the PLAY and F/R SEARCH mode, but in this radically new mechanism, in every mode can be made with the tape kept wound onto the head drum.

(2) Features of full loading mechanism
With the provision of the full loading mechanism, the operating convenience, which was hitherto a drawback of the VHS system, has been improved. A host of other salient features are also designed into this mechanism as apparent from the following description.

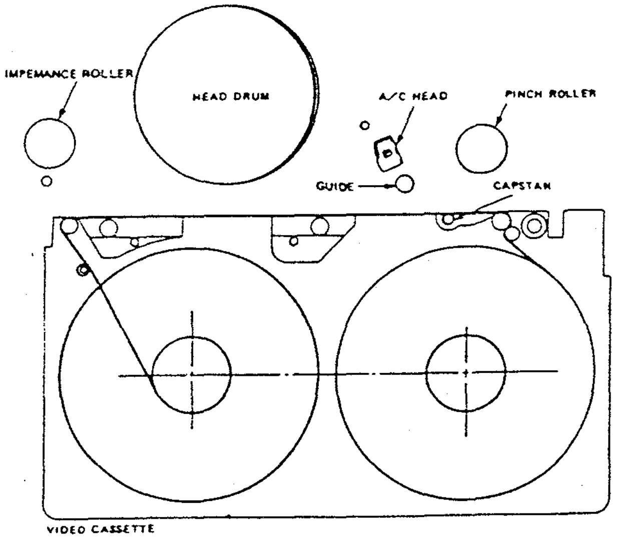


Fig. 1-1 ⓐ CONVENTIONAL VHS TAPE LOADING SYSTEM (AT FF/REW MODE)

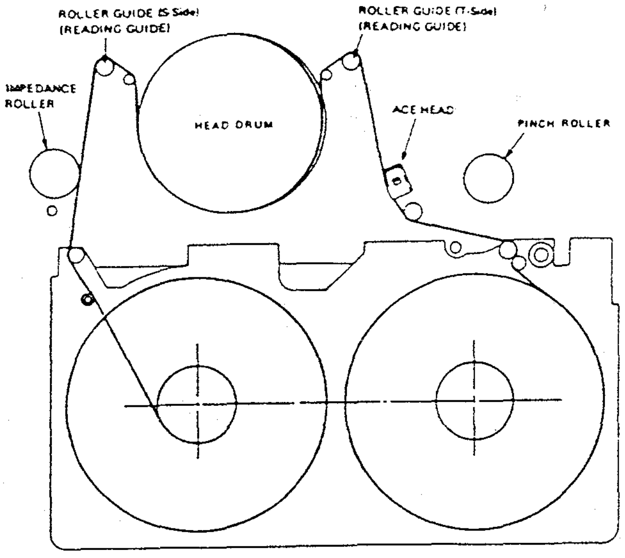


Fig. 1-1 ⓑ NEW FULL LOADING SYSTEM (AT FF/REW MODE)

III. F/R search
FF↔F-SEARCH and REW↔R-SEARCH can be made direct by reducing the mode transition

IV. Elimination of half loading mechanism
A special mechanism (the half loading mechanism in Fig. 1-2.) necessary for mounting the VISS/VASS functions and a realtime counter has hitherto been added to conventional models available, but the provision of the full loading mechanism simplifies the design of the mechanism, resulting in significantly enhanced reliability and increased convenience of operation.

(3) Protection mechanism for full loading system

I. Video Tape Protection Mechanism

(a) FF/REW→STOP
Tape tension applied to the head drum when stopping is lowered by optimizing the balance between the left and right, and brake forces acting on the left and right reel table. Thereby it prevents from causing a scratch on the tape due to V-head when stopping.

(b) STOP→FF/REW
The starting-up speed of the capstan motor is ingeniously designed to preclude the possibility of unusual tape tension at the time of REW/FWD start-up.

(c) Tape end brake damping
The design of the mechanism is so made that the time from issuance of an electrical STOP command till actual brake application is reduced to a minimum. This enable the braking to be completed before the reader tape end.

(d) FF/REW running
To ensure highly stable tape running in any condition and any environment, design consideration is given to the foundation brake torque (soft brake) to the reel table and the tape winding angle with respect to each tape guide. Particularly in regard to the supply side fixing guide and F.T.E (Full Track Erase) head, the design is so made that they do not come into contact with the tape at the time of FF/REW operation to alleviate load application.

II. Final End Position Tape Loading Protection Mechanism
Tape pull-out (loading) from within the cassette is done to ensure proper take-up of the tape onto the head drum. At that time, the tape is extended from the supply reel side.
So, if the tape is wound to the final end, no loading can be made. For this reason, a mode is designed to allow the tape to be rewound a little at the final end of the tape without any loading done.

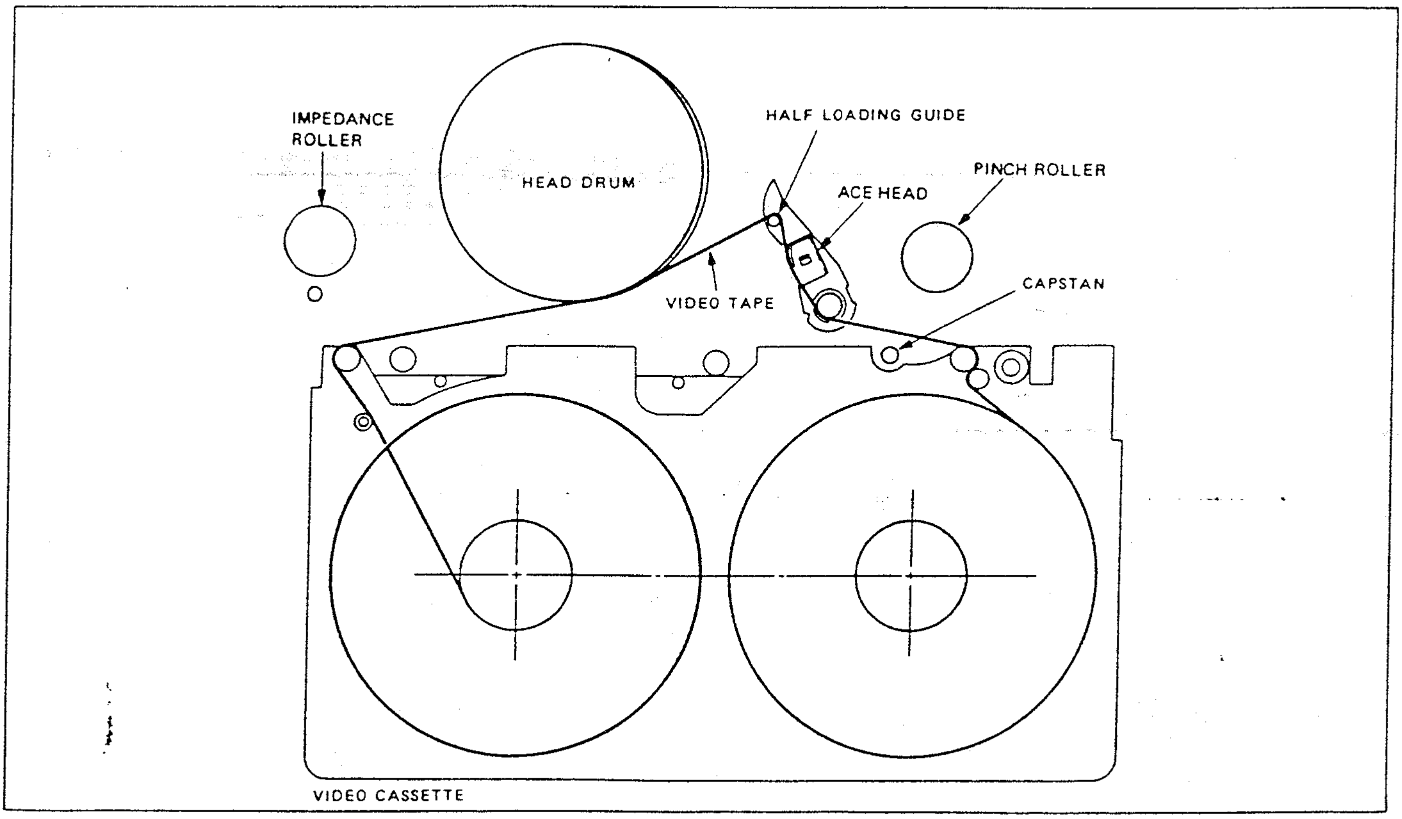


Fig. 1-2 HALF LOADING SYSTEM (AT FF/REW MODE)

2. DESCRIPTION OF MECHANISM OPERATION

2-1. BASIC OPERATION MODE OF MECHANISM

The P-88 mechanism has its original modes such as given in Table 2-1, in addition to the VTR is operation modes (STOP, FF, REW, PLAY, REC, R-SEARCH, F-SEARCH, STILL, SLOW, and ETS). These modes specific to the mechanism play important roles in tape protection operation at the time of a shift to various modes of the VTR above. A shift to the mode specific to the mechanism is carried out by controlling the rotation of the loading motor with the control signal of the system control circuit. The detection of important mechanism operation mode positions is done by using the FL START SWITCH for detecting the cassette ejection/insertion, the FL END SWITCH for detecting the cassette insert completion, and the MECHANISM MODE SWITCH for detecting each mode of the mechanism (3 bit MODE DATA is output by operating the rotary switch).

Mechanism Mode	Mechanism Mode Switch			HEX DATA	Function	VTR Operation Mode
	3	2	1			
EJECT	–	–	–		Eject position	EJECT
					Front loading/Unloading	
SHORT REW	–	–	–		Take up operation in the tape end position	Detected by FL END switch
INITIAL	1	1	1	⑦	Power off position	Power off when tape is loaded completely
					Tape unloading position Tape loading Tape loading ending position	
BRAKE	0	0	1	①	Main brake applying position	
STOP / FF/REW	0	1	0	②	STOP waiting and FF/REW (the head motor rotation)	STOP, FF/REW
STILL	0	1	1	③	The positions of STILL, SLOW or F-ADV.	STILL, SLOW, F-ADV
PLAY	1	0	0	④	From FWD direction Normal running mode	PLAY, REC, F-SEARCH
IDLER	1	0	1	⑤	Forward/reverse changeover position	PAUSE
REV	1	1	0	⑥	From REV direction Normal running mode	R-SERACH

Main Mode Shifting Conditions

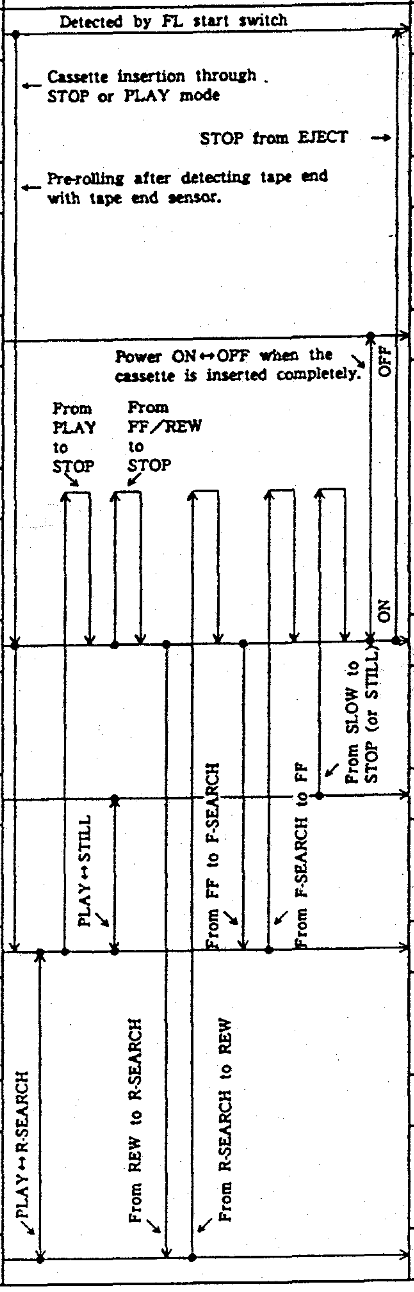

Detected by FL start switch
Cassette insertion through STOP or PLAY mode
STOP from EJECT
Pre-rolling after detecting tape end with tape end sensor.
Power ON↔OFF when the cassette is inserted completely.
OFF
ON
From PLAY to STOP
From FF/REW to STOP
From SLOW to STOP (or STILL)
PLAY↔STILL
From FF to F-SEARCH
From F-SEARCH to FF
PLAY↔R-SEARCH
From REW to R-SEARCH
From R-SEARCH to REW

Table 2-1

2-2. DESCRIPTION OF MECHANISM DRIVE

To realize the thin type mechanism, a loading motor and two pieces of cam (MAIN CAM GEAR and the MODE CAM GEAR) to be driven by the said motor are mounted on the upper part of the capstan motor, that was a dead space in the conventional mechanisms hitherto available with a view to optimization of parts mounting layout. (Fig. 2-1 and Fig. 2-2.)

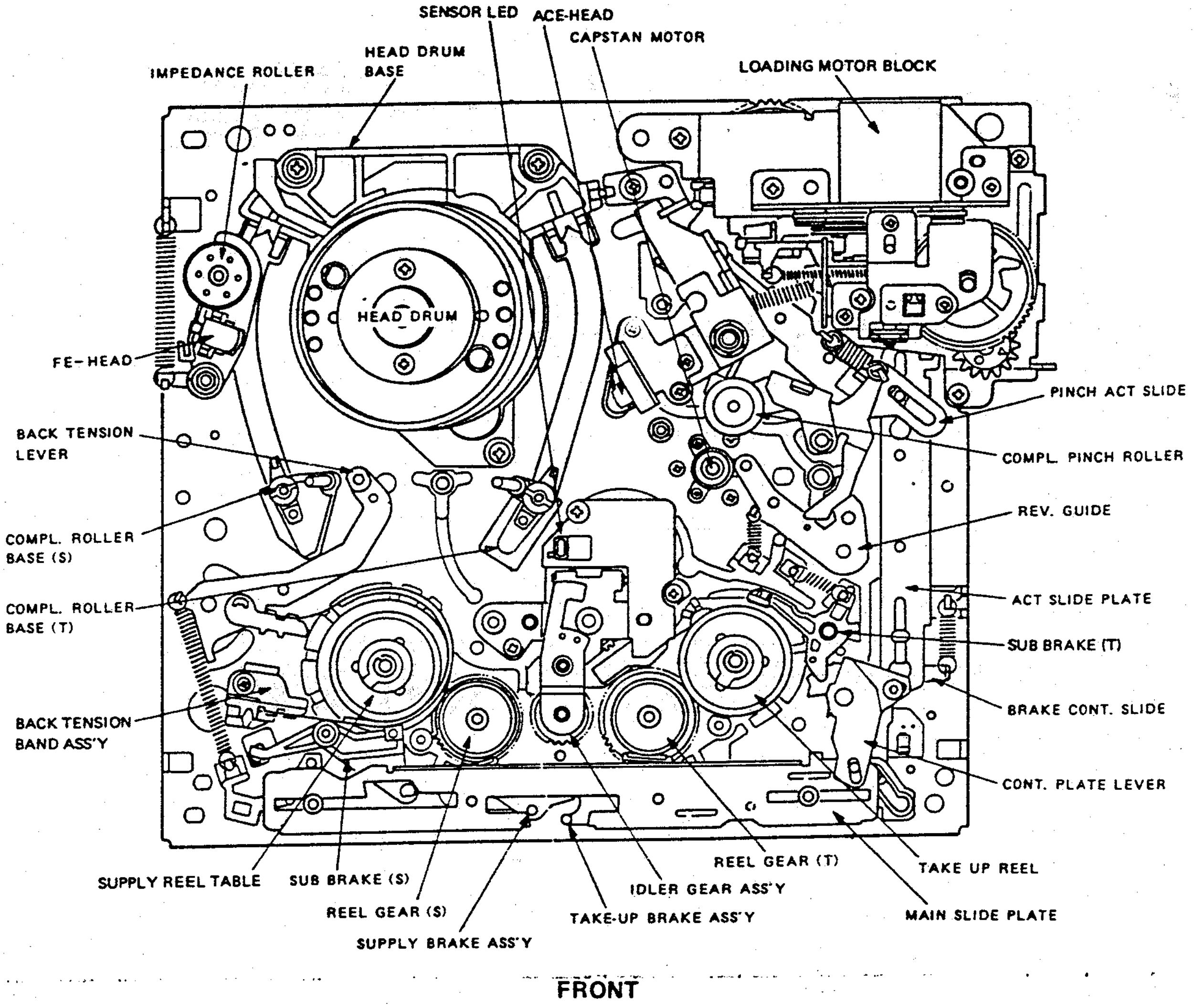

SENSOR LED
ACE-HEAD
CAPSTAN MOTOR
HEAD DRUM BASE
IMPEDANCE ROLLER
LOADING MOTOR BLOCK
HEAD DRUM
FE-HEAD
PINCH ACT SLIDE
BACK TENSION LEVER
COMPL. PINCH ROLLER
REV. GUIDE
COMPL. ROLLER BASE (S)
COMPL. ROLLER BASE (T)
ACT SLIDE PLATE
SUB BRAKE (T)
BRAKE CONT. SLIDE
BACK TENSION BAND ASS'Y
CONT. PLATE LEVER
REEL GEAR (T)
TAKE UP REEL
SUPPLY REEL TABLE
SUB BRAKE (S)
IDLER GEAR ASS'Y
REEL GEAR (S)
TAKE-UP BRAKE ASS'Y
MAIN SLIDE PLATE
SUPPLY BRAKE ASS'Y
FRONT

Fig. 2-1 TOP VIEW OF MECHANINSM

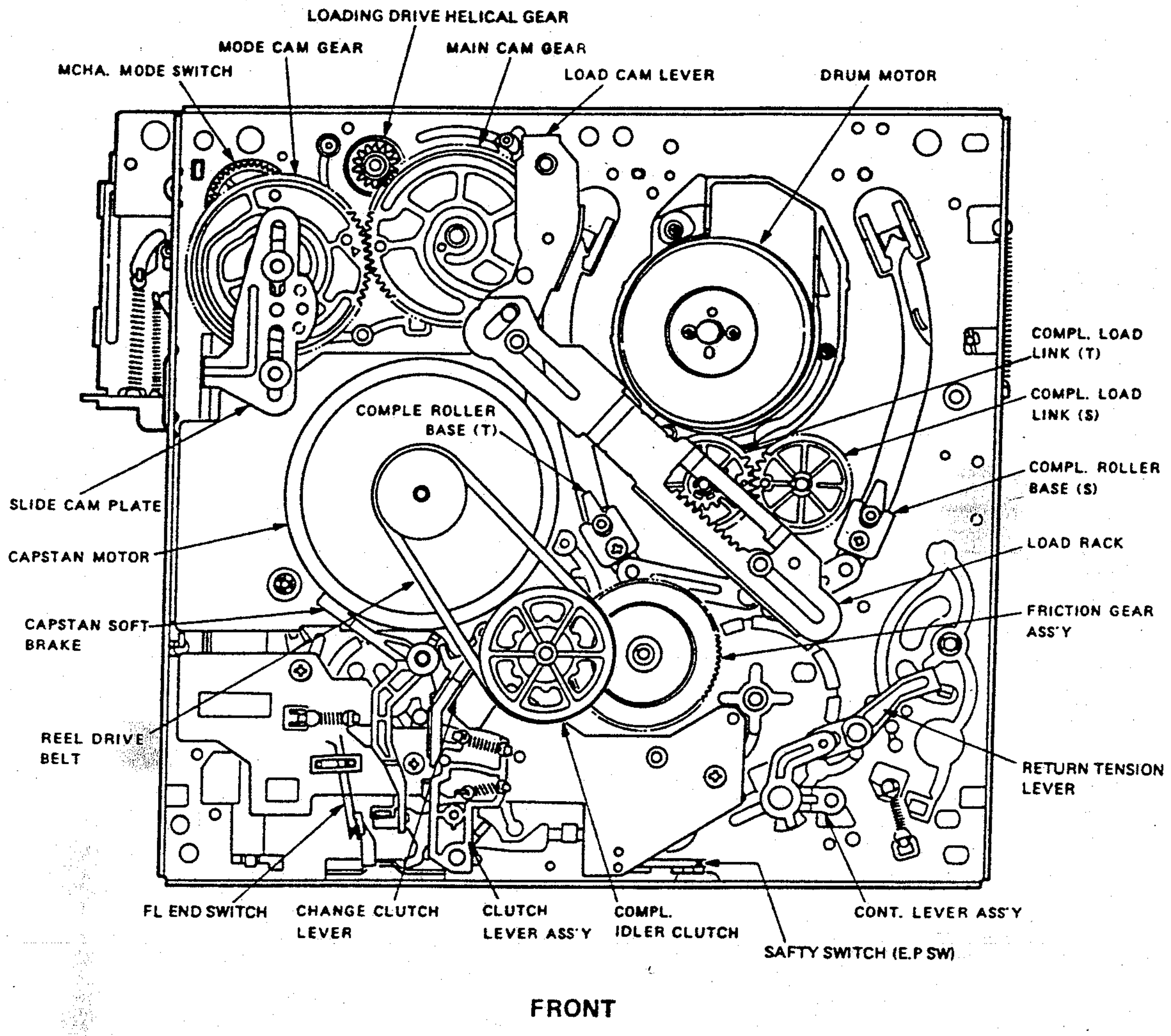

LOADING DRIVE HELICAL GEAR
MODE CAM GEAR
MAIN CAM GEAR
MCHA. MODE SWITCH
LOAD CAM LEVER
DRUM MOTOR
COMPL. LOAD LINK (T)
COMPL. LOAD LINK (S)
COMPLE ROLLER BASE (T)
COMPL. ROLLER BASE (S)
SLIDE CAM PLATE
CAPSTAN MOTOR
LOAD RACK
CAPSTAN SOFT BRAKE
FRICTION GEAR ASS'Y
REEL DRIVE BELT
RETURN TENSION LEVER
FL END SWITCH
CHANGE CLUTCH LEVER
CLUTCH LEVER ASS'Y
COMPL. IDLER CLUTCH
CONT. LEVER ASS'Y
SAFTY SWITCH (E.P SW)
FRONT

Fig. 2-2 BOTTOM VIEW OF MECHANISM

These two cams have one CAM GROOVE on both sides. A total of four CAM GROOVEs performs independent functions to meet the multi-function needs of these days by driving the elements of a wide variety of functions with the motor precisely controlled by a microcomputer.

The two cams are positive motion cams having a groove over 570 degrees. These cams cause the amount of lift to be changed by a mild gradient according to the angle of rotation while synchronizedly being rotated by an outer circumferential gear to alleviate the load exerted on the cams when driving the rod linked with the cams and also to ensure position stability in each mode of operation. The geometry of each cam and that of a metal fitting of the drive section are shown in Fig. 2-3 and Fig. 2-4, respectively. Also, the role of each cam used is described below.

On the GROOVE 3 side of MODE CAM GEAR have a small gear. This small gear is engaged with the MECHANISM MODE SWITCH as shown in Fig. 2-3., and detect the mechanism operation mode. In this way, the two cams and the MECHANISM MODE SWITCH are rotated synchronously, and the mechanism is fully synchronized and driven for each mode.

MAIN CAM GEAR :	CAM GROOVE 1. Pinch roller pressing operation CAM GROOVE 2. Tape loading mechanical drive
MODE CAM GEAR :	CAM GROOVE 3. Brake and clutch selecting operation CAM GROOVE 4. Brake control and front unloading control

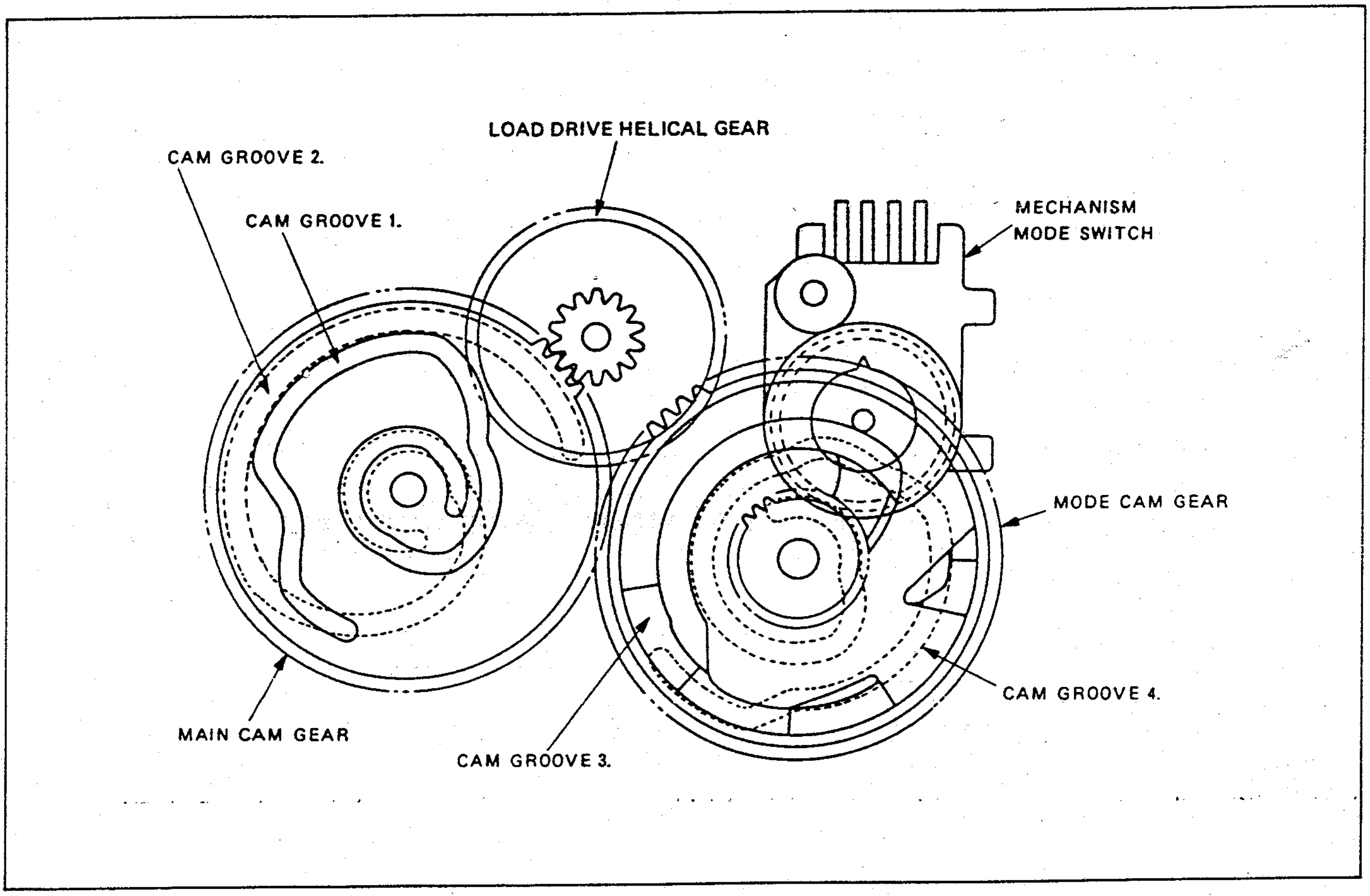


Fig. 2-3 PLAN OF CAMS CONSTRUCTION

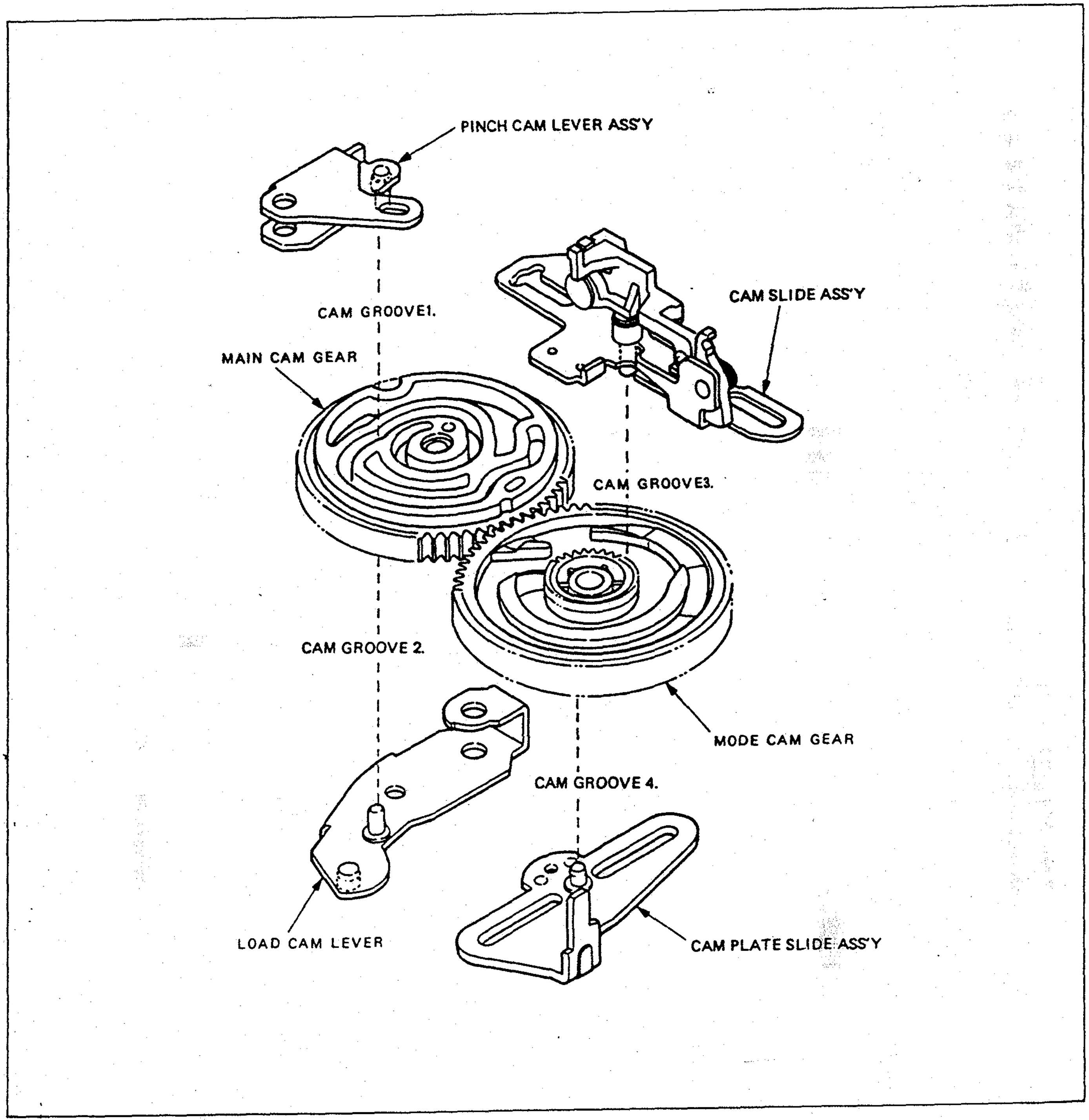

PINCH CAM LEVER ASS'Y
CAM SLIDE ASS'Y
CAM GROOVE1.
MAIN CAM GEAR
CAM GROOVE3.
CAM GROOVE 2.
MODE CAM GEAR
CAM GROOVE 4.
LOAD CAM LEVER
CAM PLATE SLIDE ASS'Y

Fig. 2-4 VIEW OF CAMS CONSTRUCTION

2-2-1. Tape Loading Mechanism

The tape loading mechanism is compactly designed with use of a LOAD RACK for loading by drive from the before-mentioned MAIN CAMs with CAM GROOVE 2. The LOAD RACK is laid on the dead space in between the DD capstan motor and the head motor for effective space utilization. (Fig. 2-5) The process from tape pull-out upon loading to contact of the leading guide section with the stopper of drum base and press-fitting under tension of spring is guided and driven in such a manner that the rod is drawn inward from the outer circumferential direction of the CAM GROOVE 2, thereby reducing the load torque (PV value) to the CAM GROOVE. And, the load of the loading motor is minimized to enhance reliability.

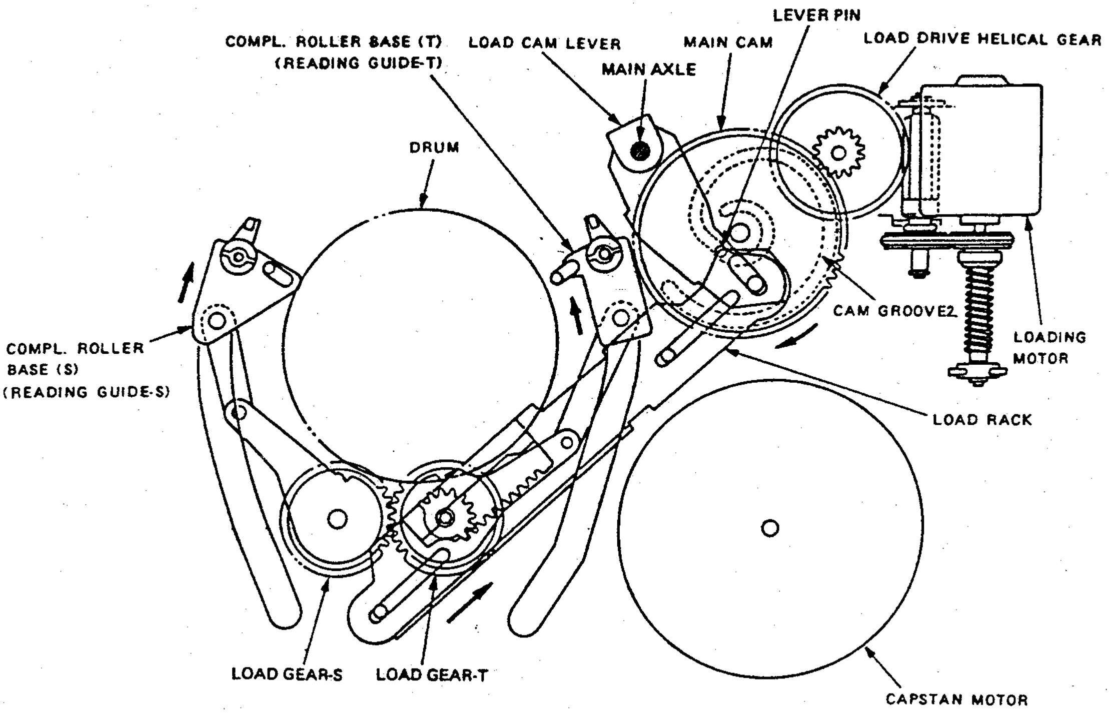

LEVER PIN
COMPL. ROLLER BASE (T) (READING GUIDE-T)
LOAD CAM LEVER
MAIN CAM
LOAD DRIVE HELICAL GEAR
MAIN AXLE
DRUM
COMPL. ROLLER BASE (S) (READING GUIDE-S)
CAM GROOVE2
LOADING MOTOR
LOAD RACK
LOAD GEAR-S
LOAD GEAR-T
CAPSTAN MOTOR

Fig. 2-5 CONSTRUCTION OF TAPE LOADING MECHANISM

2-2-2. Pinch Roller Pressing Mechanism

The PINCH LEVER assembly of the pinch roller is operated by the PINCH CAM LEVER (rod) driven by the CAM GROOVE 1 of the before-mentioned MAIN CAM, and then press-fitted to the capstan. The revolving tape guide (REV.GUIDE) is interlockingly operated with the PINCH LEVER assembly to ensure stable tape running at a fixed speed. (Fig. 2-6)

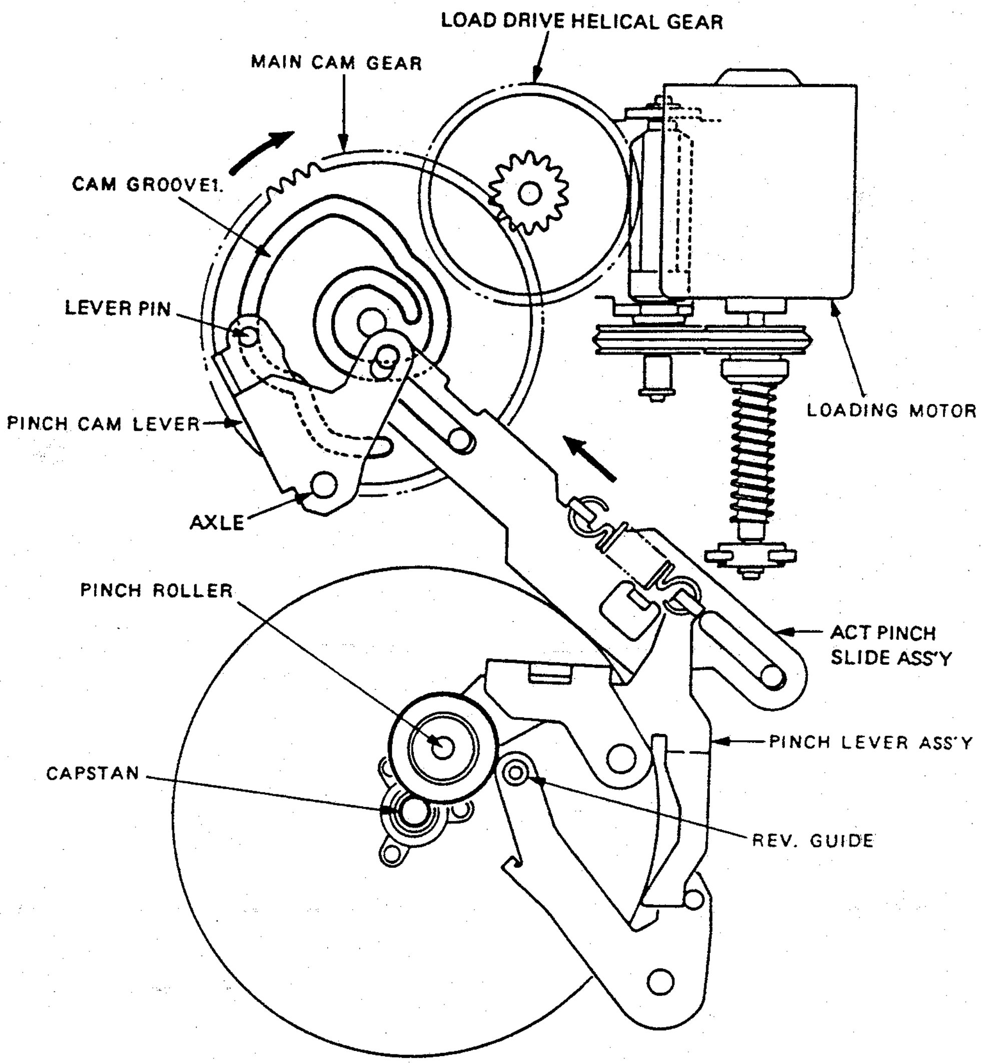

LOAD DRIVE HELICAL GEAR
MAIN CAM GEAR
CAM GROOVE1.
LEVER PIN
PINCH CAM LEVER
AXLE
LOADING MOTOR
PINCH ROLLER
ACT PINCH SLIDE ASS'Y
PINCH LEVER ASS'Y
CAPSTAN
REV. GUIDE

Fig. 2-6 CONSTRUCTION OF PINCH ROLLER MECHANISM

2-2-3. Operation of Brake Control Plate

The ACT SLIDE PLATE and the MAIN SLIDE PLATE shown in Fig. 2-7 is driven by the CAM GROOVE 4 of the MODE CAM GEAR for precise control of operations including the control of back tension lever, auxiliary brake (SUB BRAKE S/T), main brake (SUPPLY BRAKE and TAKE-UP BRAKE), clutch selection, FL END SWITCH selection, and drive selection of front loading mechanism.

Also, the mechanism mode switch is engaged with the small gear of the MODE CAM GEAR for sync rotation. At the time, the detection position of each mode is set so that it becomes the flat section at the cam curve of the CAM GROOVE 4 of the MODE CAM GEAR. So, even if motor stop time deviation occurs due to the load following the detection of the loading motor stop position, the control plate linked with a stop in the specified position.

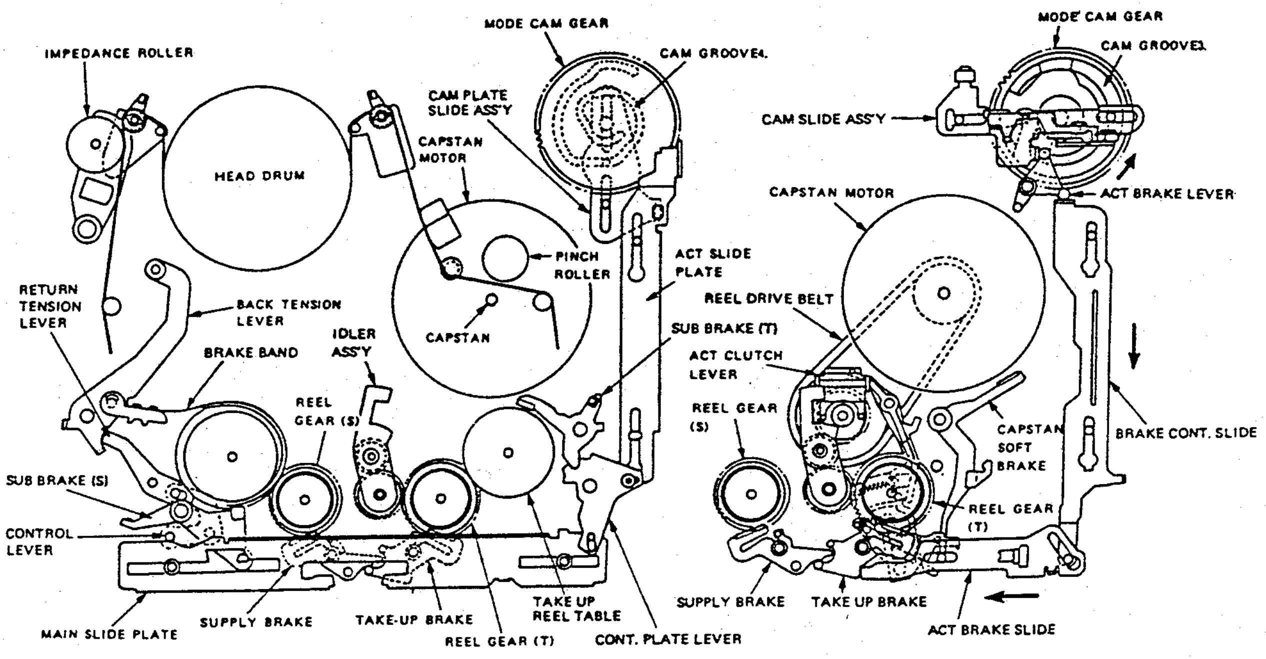

MODE CAM GEAR
IMPEDANCE ROLLER
CAM GROOVE4.
CAM PLATE SLIDE ASS'Y
CAPSTAN MOTOR
HEAD DRUM
PINCH ROLLER
ACT SLIDE PLATE
RETURN TENSION LEVER
BACK TENSION LEVER
IDLER ASS'Y
CAPSTAN
BRAKE BAND
REEL GEAR (S)
SUB BRAKE (S)
CONTROL LEVER
MAIN SLIDE PLATE
SUPPLY BRAKE
TAKE-UP BRAKE
TAKE UP REEL TABLE
REEL GEAR (T)
CONT. PLATE LEVER
MODE CAM GEAR
CAM GROOVE3.
CAM SLIDE ASS'Y
ACT BRAKE LEVER
CAPSTAN MOTOR
REEL DRIVE BELT
SUB BRAKE (T)
ACT CLUTCH LEVER
REEL GEAR (S)
CAPSTAN SOFT BRAKE
BRAKE CONT. SLIDE
REEL GEAR (T)
SUPPLY BRAKE
TAKE UP BRAKE
ACT BRAKE SLIDE

Fig. 2-7 CONSTRUCTION OF BRAKE CONTROL PLATE (AT REW/FF, STOP MODE)

2-2-4. Brake Control Mechanism

The mechanical logic of the brake state is shown in Fig. 2-8. The brake which damps the reel rotation is operated by the BRAKE CONTROL SLIDE driven from the CAM GROOVE 3 of the MODE CAM GEAR.

Also, to alleviate damage to the tape caused by high tension of the brake in operation, the tape is stopped after brake operation and the shape is thoughtfully designed for proper biting-in ratio of the left and the right brakes after-mentioned to each other.

This enables the supply brake to be released by the operation of the above-mentioned MAIN SLIDE PLATE after an elapse of prefixed slight time to reduce the tape tension to zero, and to provide the tape with a proper degree of looseness. As a result, a slight gap is created in the tape from the HEAD DRUM.

Further, a momentary still mechanism which dispenses with use of a plunger solenoid is not provided as one of design features of the P-88 mechanism.

To stabilize the image in an extremely short period of time during a shift to the STILL mode from the PLAY mode, the auxiliary brake (CAPSTAN SOFT BRAKE) is press-fit to the outer circumference of the capstan motor by the before-mentioned CAM GROOVE 3 of the MODE CAM GEAR.

These operations is interlocked with the operation of the before-mentioned ACT SLIDE PLATE and the MAIN SLIDE PLATE. It consists of one MODE CAM for offsetting the operating position.

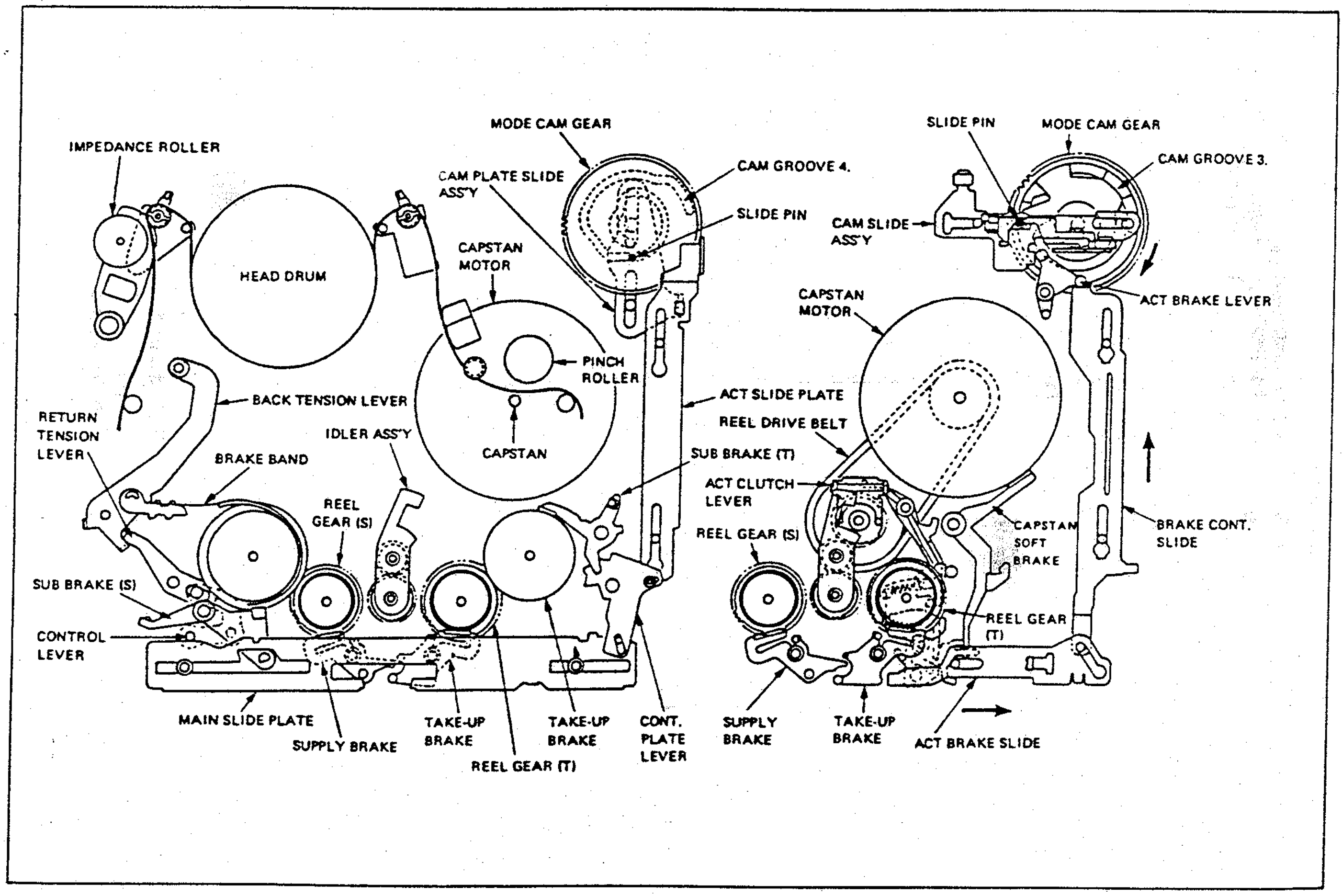

MODE CAM GEAR
IMPEDANCE ROLLER
CAM PLATE SLIDE ASS'Y
CAM GROOVE 4.
SLIDE PIN
CAPSTAN MOTOR
HEAD DRUM
PINCH ROLLER
BACK TENSION LEVER
RETURN TENSION LEVER
IDLER ASS'Y
BRAKE BAND
CAPSTAN
REEL GEAR (S)
SUB BRAKE (S)
CONTROL LEVER
MAIN SLIDE PLATE
SUPPLY BRAKE
TAKE-UP BRAKE
TAKE-UP BRAKE
REEL GEAR (T)
CONT. PLATE LEVER
ACT SLIDE PLATE
REEL DRIVE BELT
SUB BRAKE (T)
ACT CLUTCH LEVER
REEL GEAR (S)
SLIDE PIN
MODE CAM GEAR
CAM GROOVE 3.
CAM SLIDE ASS'Y
CAPSTAN MOTOR
ACT BRAKE LEVER
BRAKE CONT. SLIDE
CAPSTAN SOFT BRAKE
REEL GEAR (T)
SUPPLY BRAKE
TAKE-UP BRAKE
ACT BRAKE SLIDE

Fig. 2-8 CONSTRUCTION OF BRAKE CONTROL PLATE (AT BRAKE MODE)

2-2-5. Brake Lock Release Mechanism (FF/REW→STOP Mode)

The brake lock momentary release mechanism is shown in Fig. 2-9 ⓐ, ⓑ and Fig. 2-10.

In the FF/REW mode (Fig. 2-9 ⓐ) mechanical elastic load is given to the BRAKE LOCK LEVER mounted on the BRAKE CAM SLIDE which causes the brake to operate, and it is locked to the high-speed rotary axle of the 1st reducing section of the loading motor.

ⓐ Changes from brake mode or lock released state to FF/REW, STOP mode.

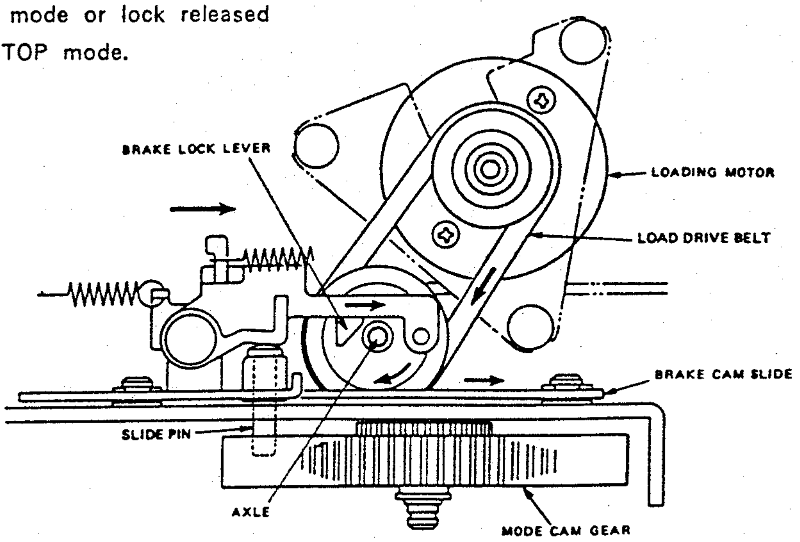

BRAKE LOCK LEVER
LOADING MOTOR
LOAD DRIVE BELT
BRAKE CAM SLIDE
SLIDE PIN
AXLE
MODE CAM GEAR

Fig. 2-9 ⓐ BRAKE LOCK & RELEASE MECHANISM

At the time of a shift to the STOP mode from the FF/REW (Fig. 2-9 ⓑ), the BRAKE LOCK LEVER releases the lock on slight rotation of the axle by contact between the rotary shaft and the friction resistance so that the brake can be instantaneously applied to the reel. The lock release speed is almost the same as the start-up of the loading motor. So, the its response to the brake is very quick, and construction is simplified also.

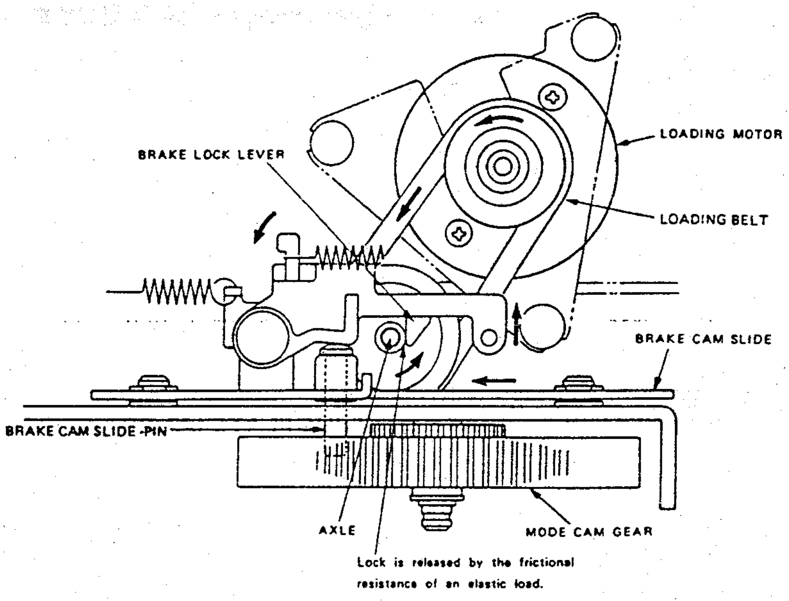

BRAKE LOCK LEVER
LOADING MOTOR
LOADING BELT
BRAKE CAM SLIDE
BRAKE CAM SLIDE-PIN
AXLE
MODE CAM GEAR
Lock is released by the frictional resistance of an elastic load.

Fig. 2-9 ⓑ BRAKE LOCK & RELEASE MECHANISM

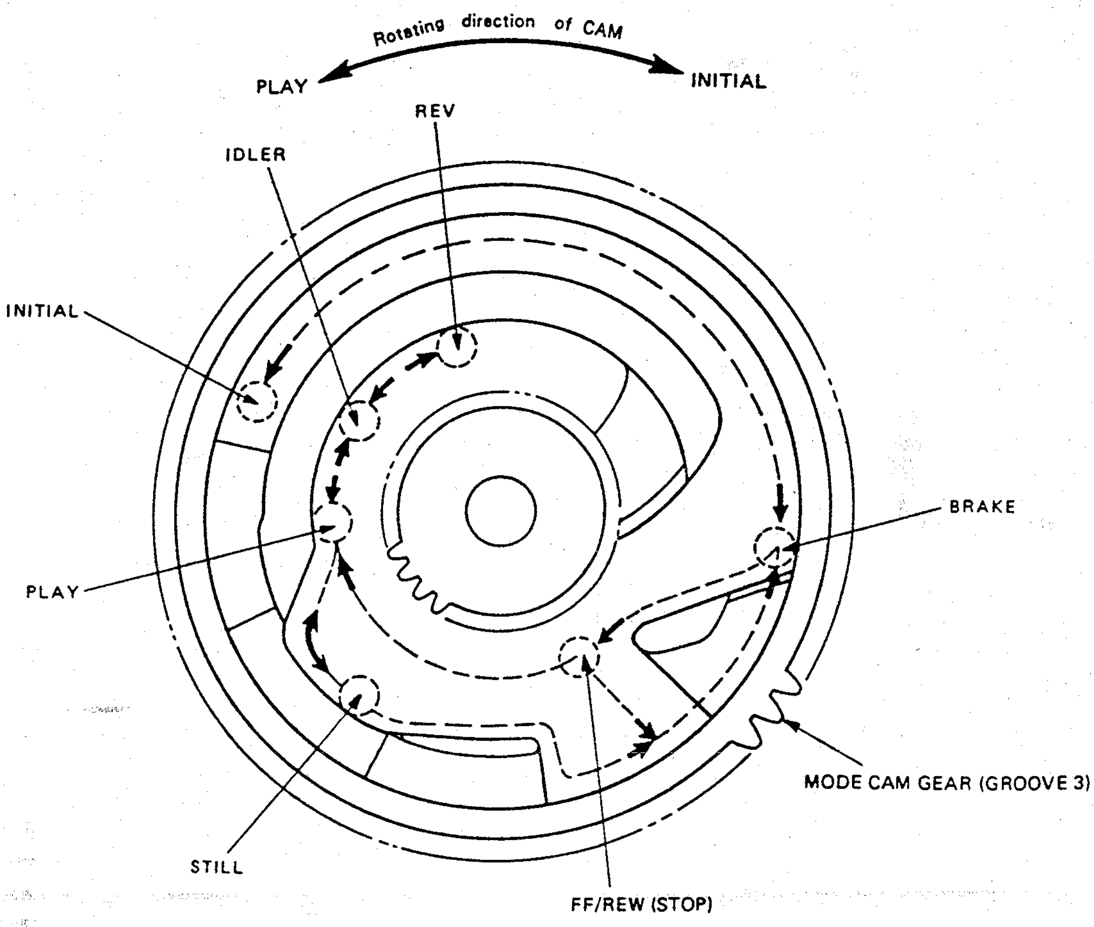

Rotating direction of CAM
PLAY
INITIAL
REV
IDLER
INITIAL
BRAKE
PLAY
MODE CAM GEAR (GROOVE 3)
STILL
FF/REW (STOP)

Fig. 2-10 POSITIONING OF BRAKE CAM SLIDE-PIN ON THE GROOVE 3 OF MODE CAM GEAR

2-3. REEL TABLE DRIVE

2-3-1. Reel Table Drive Mechanism

This mechanism employs the system of driving the tape from the DD capstan motor via rubber belt. In the tape constant speed running mode for PLAY, F-SEARCH, and R-SEARCH, the capstan and the pinch roller are press-fitted to allow the tape to run at a constant speed. By providing a FRICTION MECHANISM in between the capstan motor and the reel table, the tape is taken up. In the FF/REW tape high-speed take-up mode, the capstan and the pinch roller are separated from each other, and the capstan motor and the reel table are linked direct by the clutch mechanism to carry out tape take-up. Also, to realize a thin type reel table drive section, the mechanism is simplified and the rotary parts are thinned for realization of physically compact design, and a step is provided on the reel table mounting section of the chassis by high-precision drawing process. A simplified figure of the drive mechanism is shown in Fig. 2-11 and Fig. 2-12. Power transmission to the pulley of the clutch mechanism section is done from the DD capstan motor via rubber belt.

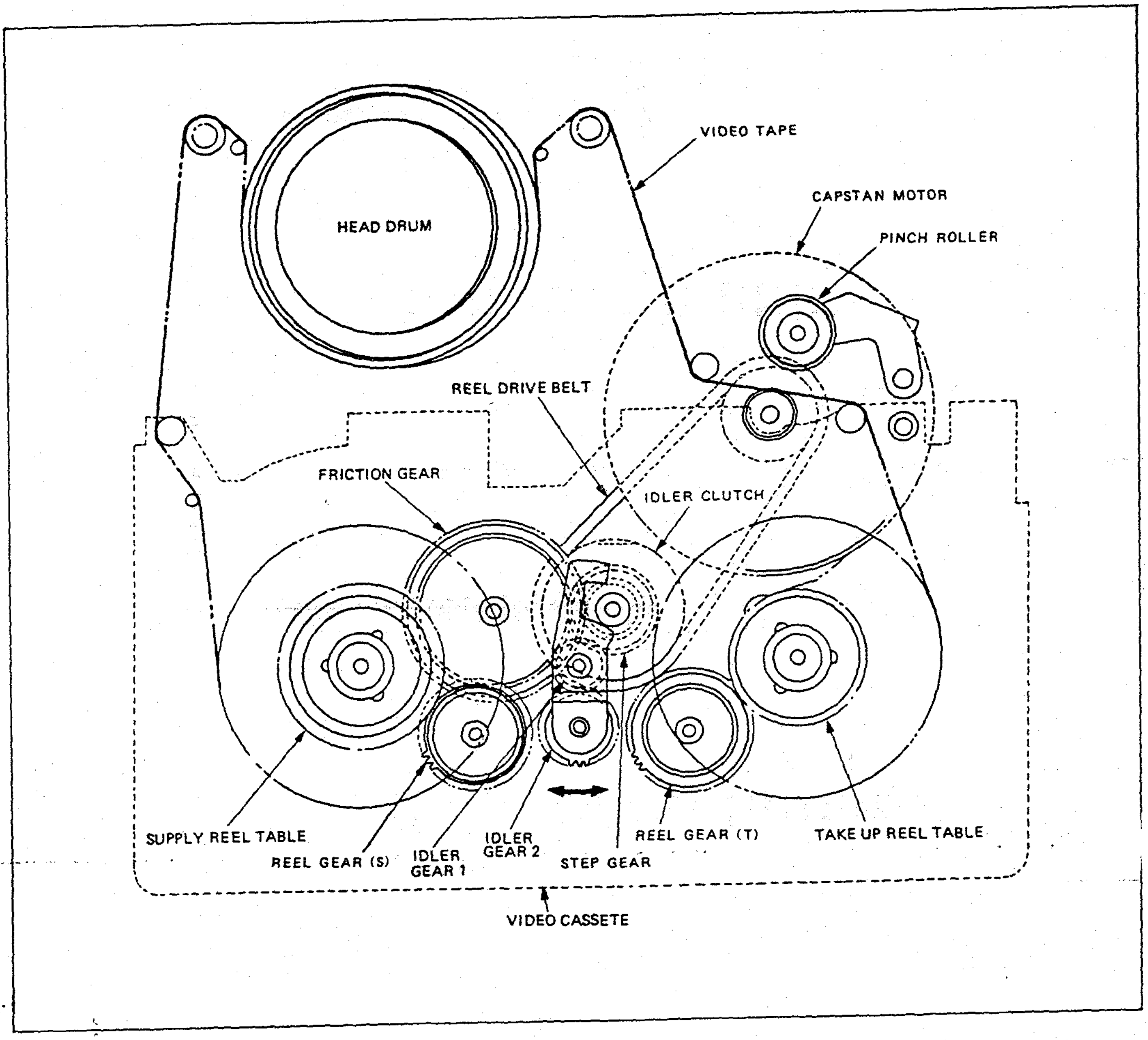

VIDEO TAPE
CAPSTAN MOTOR
PINCH ROLLER
HEAD DRUM
REEL DRIVE BELT
FRICTION GEAR
IDLER CLUTCH
SUPPLY REEL TABLE
REEL GEAR (S)
IDLER GEAR 1
IDLER GEAR 2
STEP GEAR
REEL GEAR (T)
TAKE UP REEL TABLE
VIDEO CASSETE

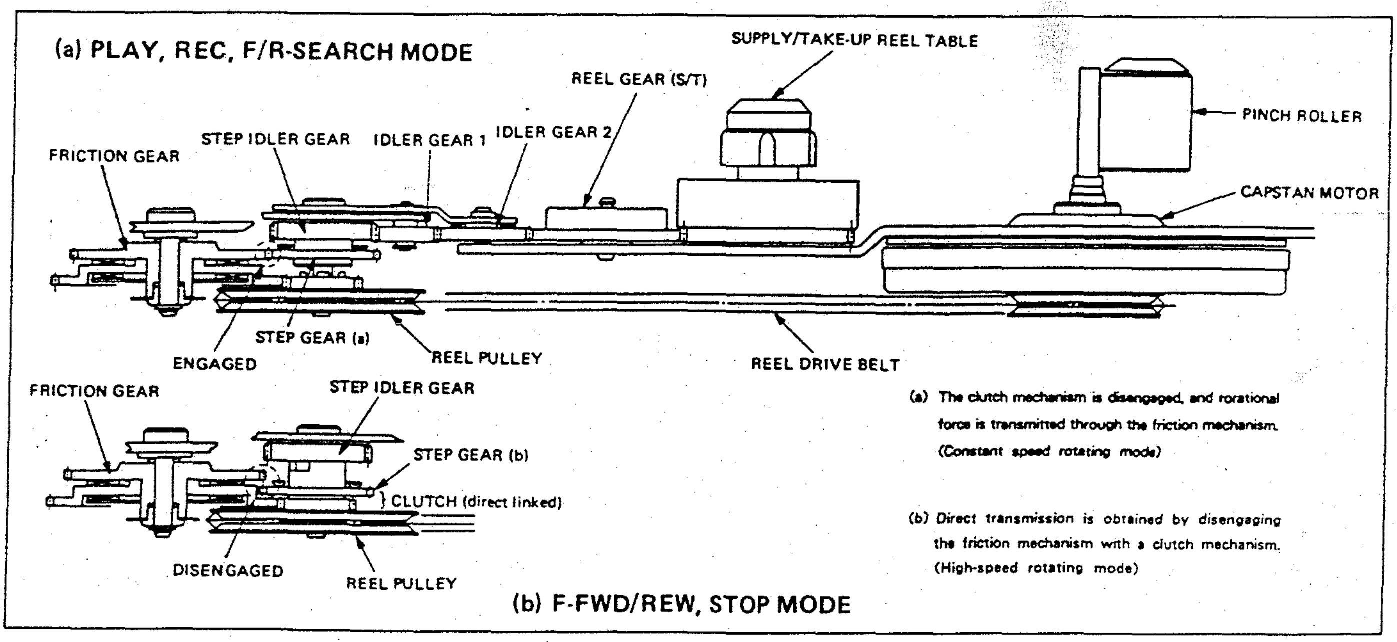
Fig. 2-11 REEL TABLE DRIVE

At that time, the reel table winding speed and the torque needed in a wide variety of modes are obtained by shifting the up and down STEP GEAR positioned at the upper section of pulley. The selection of the STEP GEAR is precision controlled by the MODE CAM GEAR via the BRAKE CONTROL SLIDE. With the up and down STEP GEAR down, the clutch mechanism is direct linked, and the transmission power from the capstan motor is sent to the reel table via IDLER GEAR assembly and REEL GEAR (S/T). On the other hand, FRICTION MECHANISM acts between the pulley and the STEP GEAR when the up and down STEP GEAR are in the elevated state, thereby controlling the transmission torque for generation of the take-up slip. Normally, it is desirable that the take-up torque of the reel table is higher in the R-SEARCH mode than that in the PLAY mode. This is because in the forward tape running the tape winding load to the HEAD DRUM has to be taken care of the capstan and the pinch roller.

While, in the reverse tape running mode the winding load has to be taken on the take-up reel table. In the special playback operation, a mechanism for varying the take-up torque of the reel table is required to be changed depending upon the running direction of the tape. But in this mechanism, the torque selection is made by varying the reduction speed ratio up to the reel table from the capstan motor on both the forward side and the reverse side of the tape. Also, design simplification of the selection mechanism is realized by using a single friction mechanism. In other words, the take-up torque necessary for forward/reverse rotation is obtained by controlling the capstan motor speed.

Rotation speed and torque needed for each mode of operation are converted by clutch mechanism for transmission of the drive power to the idler mechanism. The left and right moving IDLER GEAR assembly is automatically rotated to the left and the right according to the direction of capstan motor rotation by using the friction force. Because the mechanism is so designed as to drive the reel table of the side on which the tape is transported by the capstan and pinch roller, the forward and reverse constant speed drive (the PLAY, REC, F/R SEARCH modes) is carried out in the state in which the FRICTION MECHANISM is being operated (Fig. 2-12 ⓐ) On the other hand, in the condition in which the friction mechanism is not in operation, the forward/reverse high speed drive (FF/REW mode) is made possible (Fig. 2-12 ⓑ). Also, the reel drive in all modes is taken care of by the single left and right moving idler for design simplification.

The idler body employs gear drive to improve reliability with a view to realizing parts thinning while securing the transmission reliability. Using a resin molded gear as material of an idler, the efficiency of the entire reel drive system has been improved because there are no deformation and loss, and minimized rotation moving torque necessary for biting-in as in the case of a material such as rubber which shows considerable elastic deformation, etc. Further in this mechanism, an intermediate gear is provided in between the reel side and the idler to minimize the rotating and moving angle of the left and right moving idlers, thereby holding the reversing time to a minimum when shifting to the tape running direction change mode. This results in significantly reduced possibility of tape looseness.


(a) PLAY, REC, F/R-SEARCH MODE

(b) F-FWD/REW, STOP MODE

(a) The clutch mechanism is disengaged, and rorational force is transmitted through the friction mechanism. (Constant speed rotating mode)

(b) Direct transmission is obtained by disengaging the friction mechanism with a clutch mechanism. (High-speed rotating mode)

Fig. 2-12 REEL TABLE DRIVE (SIDE VIEW)

2-3-2. Reel Table Drive Clutch Lock and Release Mechanism

As described in the preceding section, using the selection of the step gear (CLUTCH MECHANISM), two mechanisms which are driven by being selected via direct drive or via FRICTION MECHANISM from the capstan motor, to execute the reel table drive. The operating status of the clutch lock and the releasing mechanism is shown in Fig. 2-13.

Fig. 2-13 ① shows the tape unloading position (INITIAL position) when the power for the mechanism operating mode is switched off.

At that times all the levers are in the initial positions, and the clutch is released also so that a route for reel table drive is created via a friction mechanism.

Fig. 2-13 ② shows that the mechanism operation mode has executed the tape loading and that it has completed its movement to the STOP (stand-by), FF/REW position.

At this time, the CLUTCH ACT LEVER is operated by the hook of the ACT BRAKE SLIDE to move the ACT CLUTCH LEVER in the direction of arrow via the CLUTCH LEVER and the CLUTCH CHANGE LEVER. Now, the up and down STEP GEAR is placed into the direct coupled state. In the FF/REW mode, the reel table is directly driven so that the rotation of the capstan motor is directly transmitted to make high-speed rotation drive possible. When shifting the mode to the STOP from the FF/REW in this condition, the mechanism mode position is once moved back to the brake position, and when the reel table brake is instantaneously applied, the clutch is released once at the same time, after which it returns to the same mechanism mode as the FF/REW mode once again. Now, it is placed in a waiting state in the same condition of the STOP mode as shown in Fig. 2-13 ②.

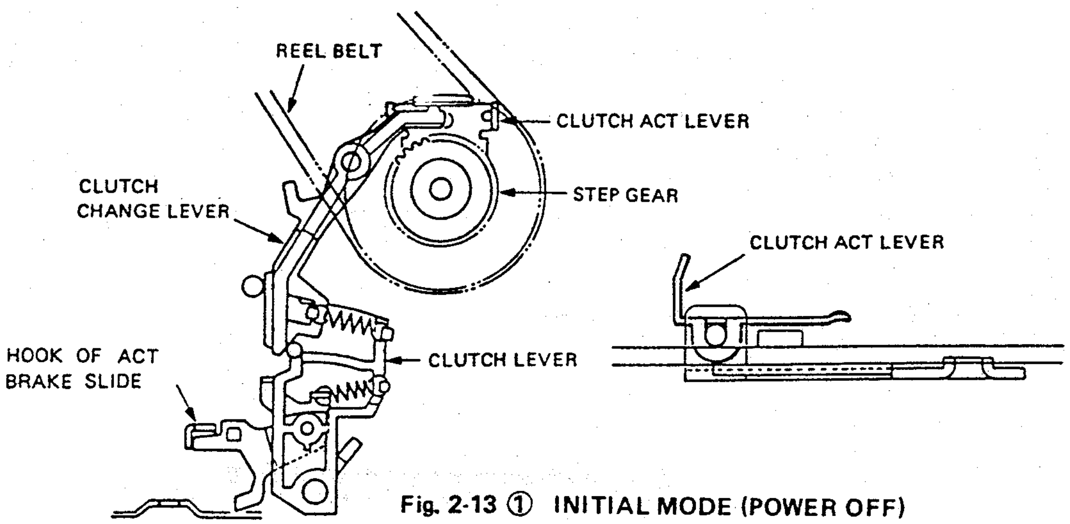

REEL BELT
CLUTCH ACT LEVER
STEP GEAR
CLUTCH CHANGE LEVER
CLUTCH ACT LEVER
HOOK OF ACT BRAKE SLIDE
CLUTCH LEVER

Fig. 2-13 ① INITIAL MODE (POWER OFF)

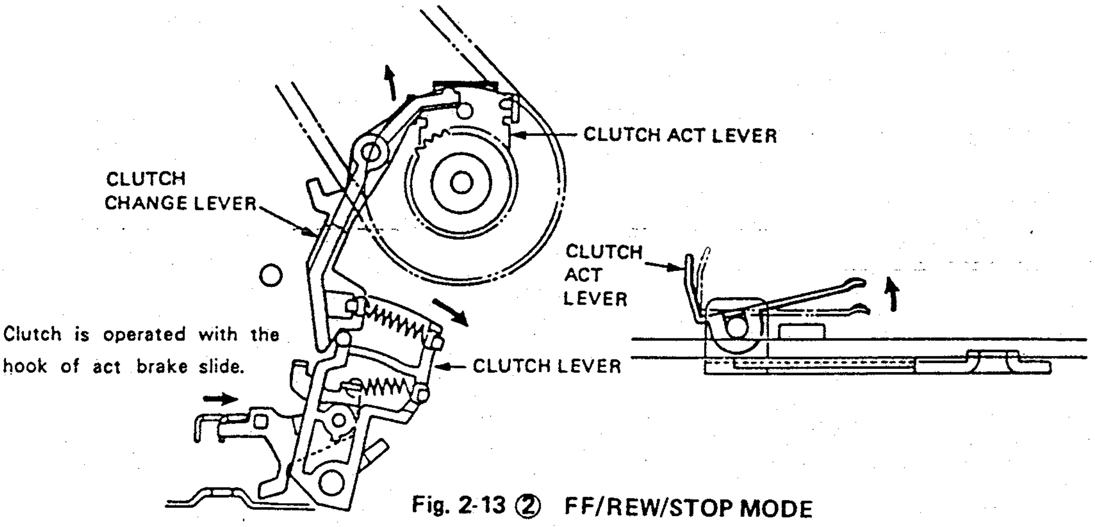

CLUTCH ACT LEVER
CLUTCH CHANGE LEVER
CLUTCH ACT LEVER
Clutch is operated with the hook of act brake slide.
CLUTCH LEVER

Fig. 2-13 ② FF/REW/STOP MODE

Fig. 2-13 ① – ③ REEL TABLE DRIVE CLUTCH LOCK AND RELEASE MECHANISM

Fig. 2-13 ③ shows the completion state of a shift to the PLAY mode via the STILL mode from the STOP (FF/REW) mode for the mechanism mode position.
In the case of this mode shifting, the movement of the BRAKE ACT SLIDE remains fixed. So, the CLUTCH ACT LEVER should be unlocked by the movement of the hook of the MAIN SLIDE PLATE to cause the clutch to be released. This movement in turn causes the capstan motor rotation to be transmitted via the friction mechanism. So, the constant speed rotation drive necessary for the PLAY (REC) mode and SEARCH mode is made possible.

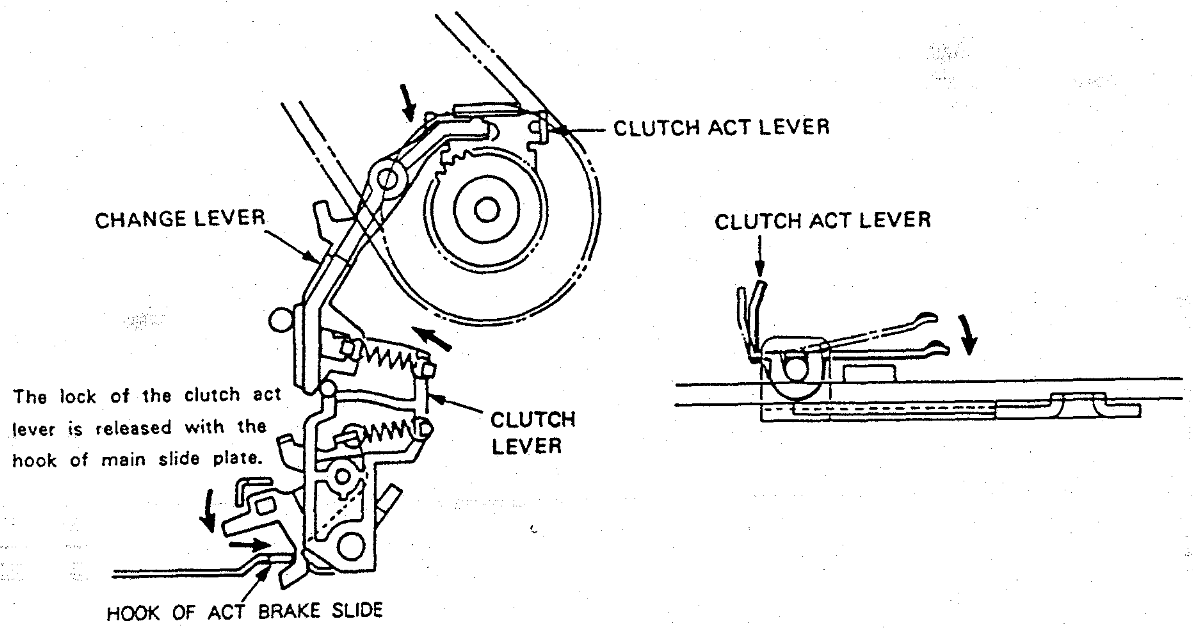

CLUTCH ACT LEVER
CHANGE LEVER
CLUTCH ACT LEVER
The lock of the clutch act lever is released with the hook of main slide plate.
CLUTCH LEVER
HOOK OF ACT BRAKE SLIDE

Fig. 2-13 ③ FF/REW/STOP MODE → STILL MODE → PLAY MODE

2-4. FRONT LOADING DRIVE SELECTION MECHANISM

In the P-88 mechanism, the motor dedicated to the use of front loading is not employed. The drive source is utilized instead of the tape loading motor. As shown in Fig. 2-14 ⓐ/ⓑ, during the front loading the FRONT LOAD WORM GEAR directly coupled to the tape loading motor axle and the FRONT HELICAL GEAR with several teeth missing are engaged with each other and rotated for transmission of the drive force to the front loading mechanism. When the cassette tape is inserted completely in the mechanism, the FRONT HELICAL GEAR is automatically disengaged from the FRONT LOAD WORM GEAR. After that, the tape loading operation is performed without the tape loading motor drive force being transmitted to the front loading mechanism.

While the drive force is being transmitted to the front loading mechanism, the CAM GROOVEs of the before-mentioned MAIN CAM GEAR and the MODE CAM GEAR are flat in cam line pattern. These are therefore held without changing the mode state of the mechanism in any way.

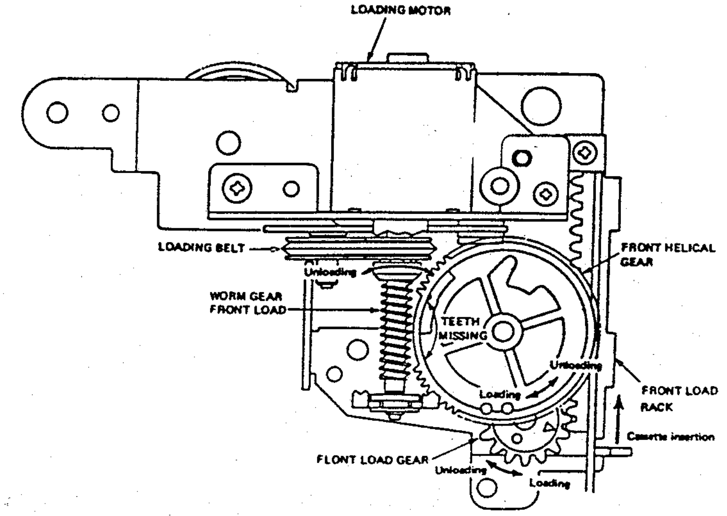

LOADING MOTOR
LOADING BELT
Unloading
WORM GEAR
FRONT LOAD
TEETH
MISSING
FRONT HELICAL
GEAR
Unloading
Loading
FRONT LOAD
RACK
Cassette insertion
FLONT LOAD GEAR
Unloading
Loading

Fig. 2-14 ⓐ FRONT LOADING DRIVE SELECTION MECHANISM (CASSETTE INSERTED POSITION)

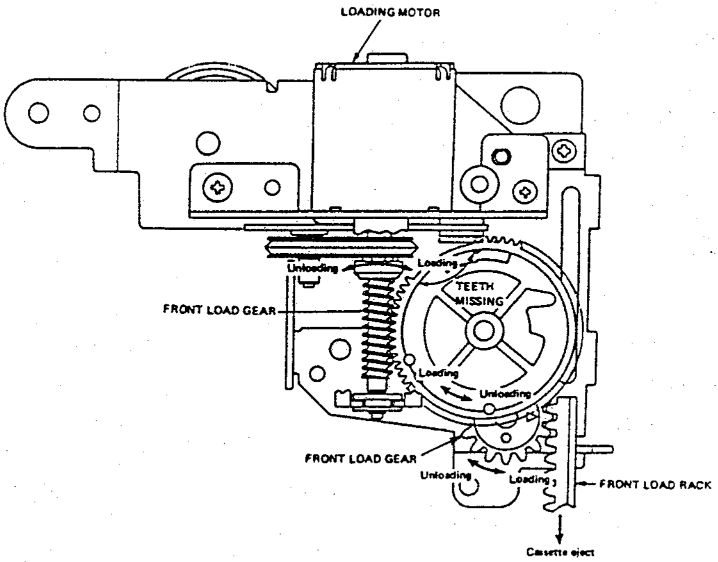

LOADING MOTOR
Unloading
Loading
TEETH
MISSING
FRONT LOAD GEAR
Loading
Unloading
FRONT LOAD GEAR
Unloading
Loading
FRONT LOAD RACK
Cassette eject

Fig. 2-14 ⓑ FRONT LOADING DRIVE SELECTION MECHANISM (CASSETTE EJECTED POSITION)

(A) Cassette inserting operation

When inserting a cassette from the cassette ejected state of Fig. 2-14 ⓑ, the FL START SWITCH shown in Fig. 2-15 is turned OFF, to cause the loading motor to be rotated in the direction of insetting. As a result, the FRONT LOAD RACK is drawn in, and the front loading is made up to the cassette tape completion point. So, it is locked in the grooves shown in Fig. 2-15 to complete cassette inserting. At that time, the FRONT HELICAL GEAR is positioned at ⓐ of Fig. 2-14, and is released from the front loading mechanism, therefore, the tape loading operation is continuously performed.

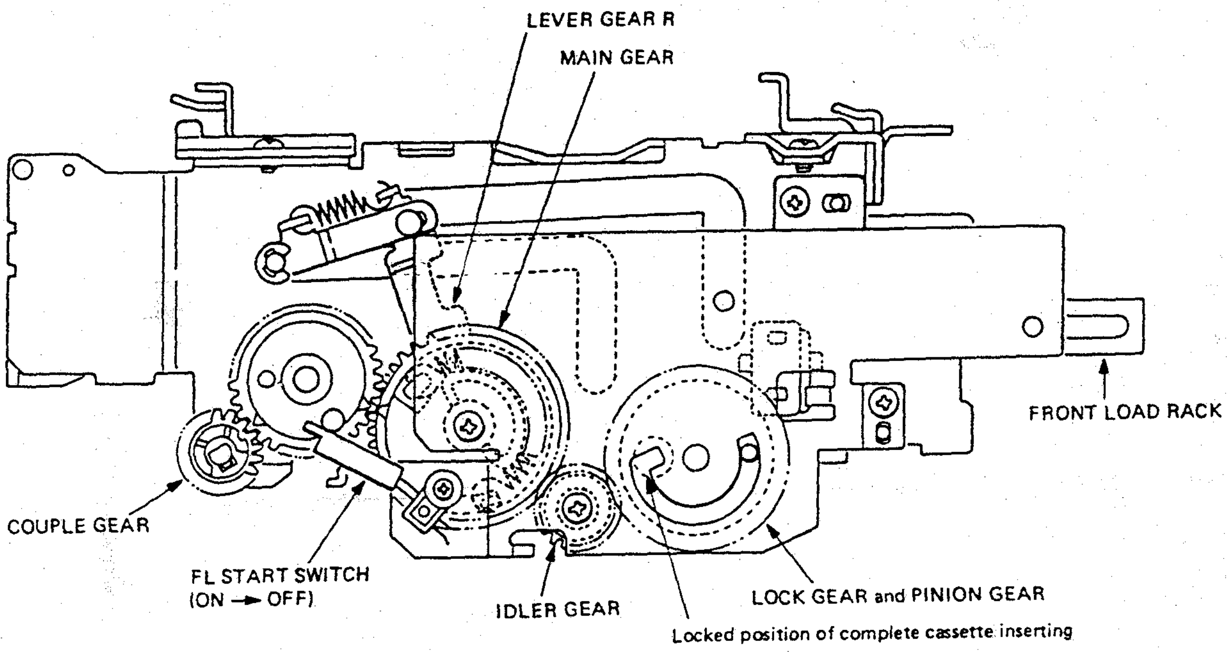

LEVER GEAR R
MAIN GEAR
FRONT LOAD RACK
COUPLE GEAR
FL START SWITCH
(ON → OFF)
IDLER GEAR
LOCK GEAR and PINION GEAR
Locked position of complete cassette inserting

Fig. 2-15 CASSETTE HOLDER MECHANISM (CASSETTE INSERTING OPERATION)

(B) Cassette ejection operation

The components of the front loading mechanism is shown in Fig. 2-16.

When ejecting the cassette from the inserted state shown in Fig. 2-14 ②, the FRONT ACT LEVER is pushed in the direction of arrow due to the ACT SLIDE PLATE moves in the direction of arrow shown in Fig. 2-17. As·a result, the FRONT LEVER assembly is turned counterclockwise via the FRONT LOAD SLIDE to cause the FRONT HELICAL GEAR to be engaged with the FRONT LOAD WORM GEAR of the loading motor. At that time, the loading motor is being rotated counterclockwise, so that the FRONT HELICAL GEAR is caused to be rotated counterclockwise also to carry out the front unloading via the FRONT LOAD GEAR and the FRONT LOAD RACK. At the same time, the FRONT ACT LEVER is operated counterclockwise by the hook of the FRONT HELICAL GEAR. This releases the lock being pushed in the direction of arrow indicated by the ACT SLIDE PLATE. So, the FRONT LOAD SLIDE assembly now moves to the initial position to prepare for the next ejection operation. Incidentally, the movement of the FRONT LEVER assembly performs an important function of positioning the FRONT HELICAL GEAR (Fig. 2-14 ⓐ) upon completion of cassette mounting, in addition to the cassette eject start-up operation.

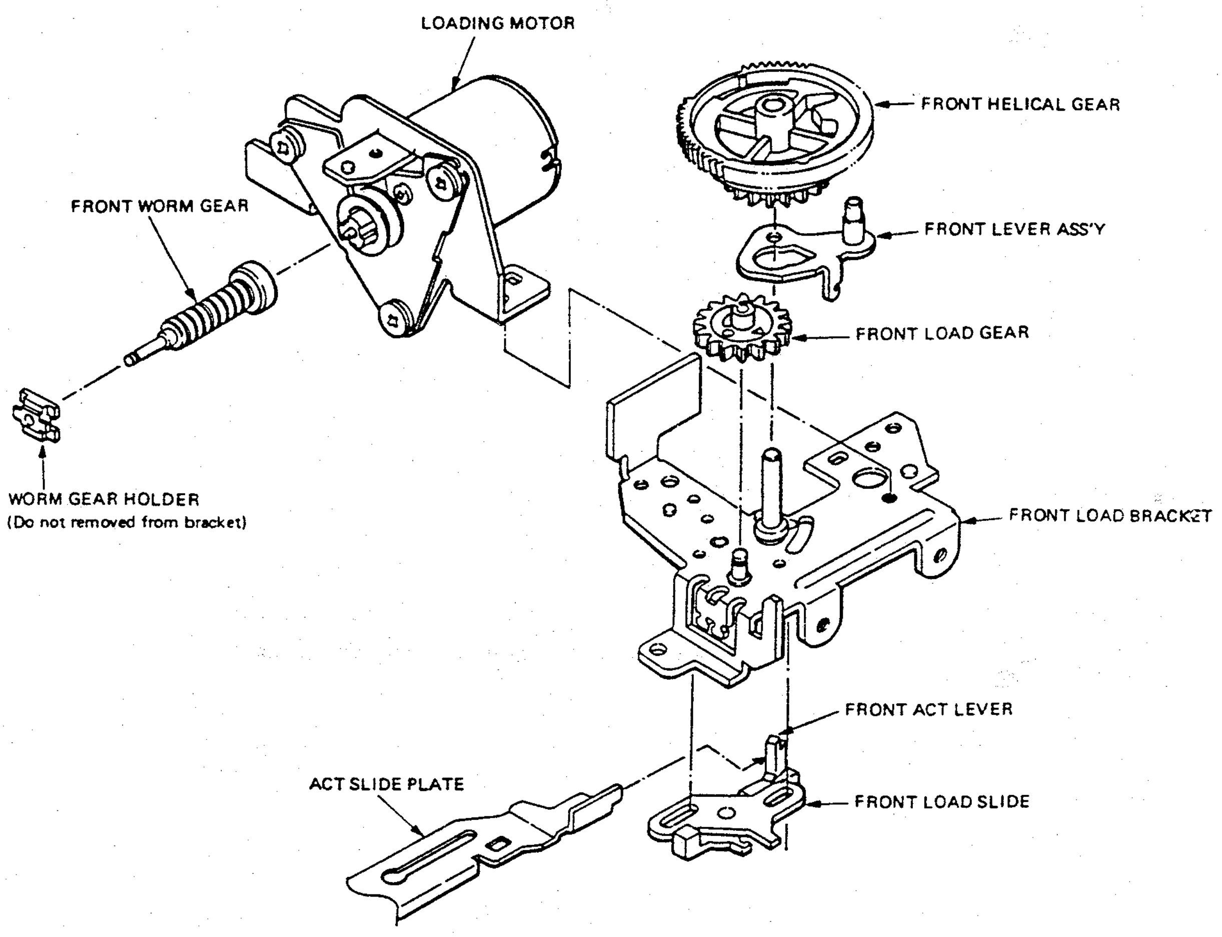
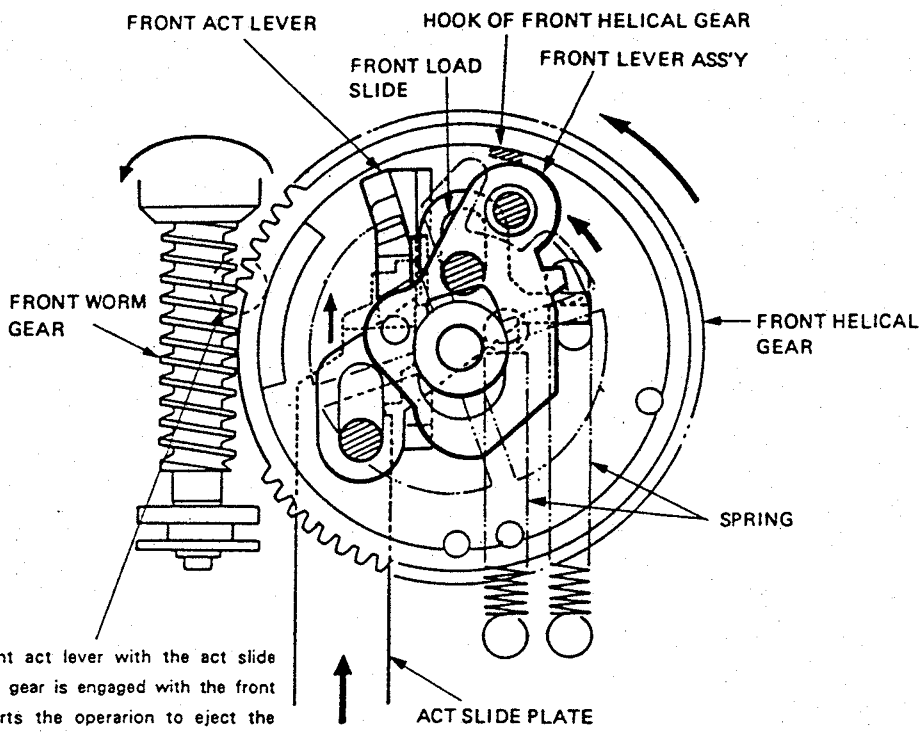

LOADING MOTOR
FRONT HELICAL GEAR
FRONT WORM GEAR
FRONT LEVER ASS'Y
FRONT LOAD GEAR
WORM GEAR HOLDER
(Do not removed from bracket)
FRONT LOAD BRACKET
FRONT ACT LEVER
ACT SLIDE PLATE
FRONT LOAD SLIDE

Fig. 2-16 FRONT LOADING DRIVE SELECTION MECHANISM


FRONT ACT LEVER
HOOK OF FRONT HELICAL GEAR
FRONT LOAD SLIDE
FRONT LEVER ASS'Y
FRONT WORM GEAR
FRONT HELICAL GEAR
SPRING
ACT SLIDE PLATE

By pressing the front act lever with the act slide plate, the front worm gear is engaged with the front helical gear, and starts the operarion to eject the cassette.

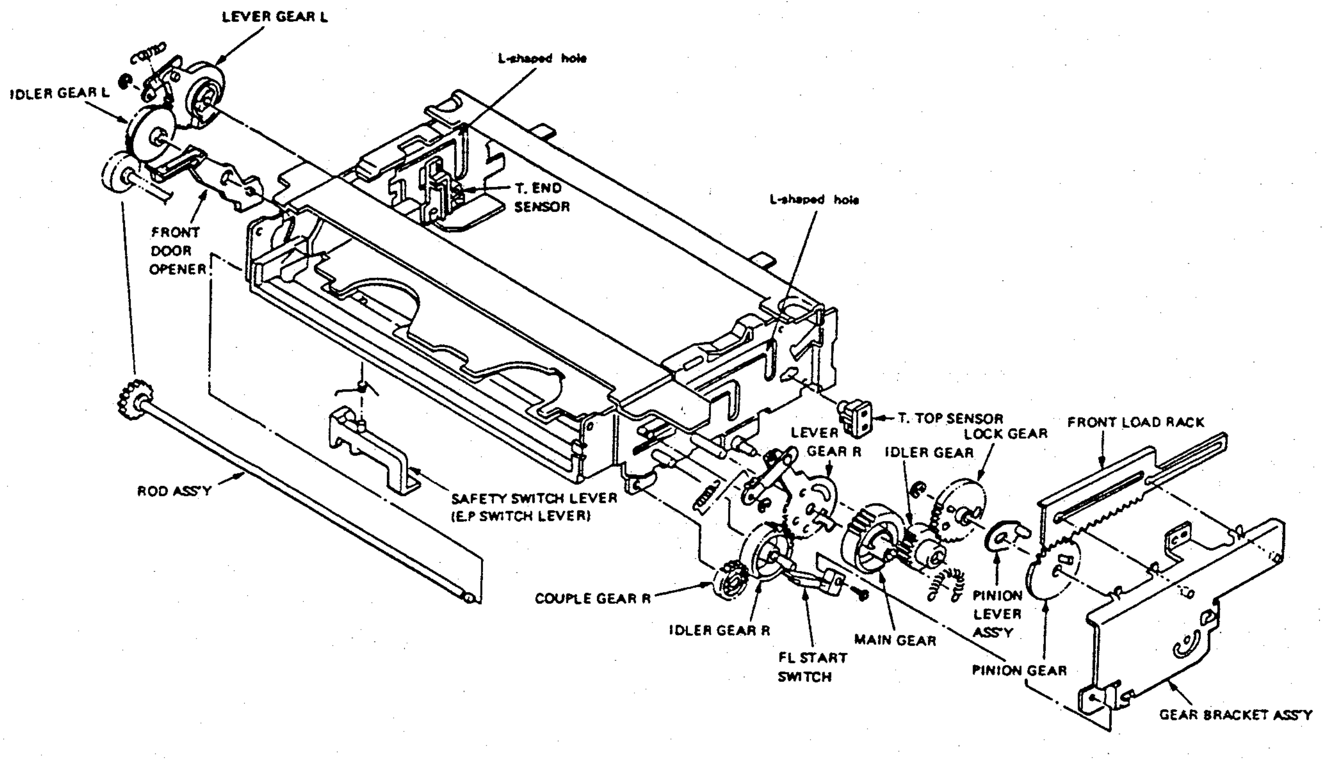
Fig. 2-17 CASSETTE EJECTION START OPERATION (See through top view)

2-5. CASSETTE HOLDER MECHANISM

2-5-1. Components

The exploded view of the cassette holder mechanism is shown in Fig. 2-18. This mechanism consists of a cassette tray for feeding the cassette tape to the specified position of the mechanism chassis, a side plate provided with L type holes for supporting and guiding it, the top plate for regulating the width of left and right, and a group of gears for driving the cassette tray.

The entire mechanism is of independent construction apart from the mechanism body. The holder is fixed on the mechanism chassis by inserting the pawls at two points and tightening the setscrews at two points, or at a total of four points.



LEVER GEAR L
IDLER GEAR L
L-shaped hole
T. END SENSOR
FRONT DOOR OPENER
L-shaped hole
T. TOP SENSOR
LEVER
GEAR R
LOCK GEAR
IDLER GEAR
FRONT LOAD RACK
ROD ASS'Y
SAFETY SWITCH LEVER (E.P SWITCH LEVER)
COUPLE GEAR R
IDLER GEAR R
FL START SWITCH
MAIN GEAR
PINION LEVER ASS'Y
PINION GEAR
GEAR BRACKET ASS'Y

Fig. 2-18 EXPLODED VIEW OF THE CASSETTE HOLDER MECHANISM

2-5-2. Description of Cassette Holder

The cassette holder is of motor-less design, as the lowering of mechanism height and driving source are done by the loading motor of the mechanism body.

As a substitute for the worm gear system hitherto used in the major drive section for the drive selection mechanism mentioned in section 2-4., the RACK LOADING system is adopted in this cassette holder mechanism. By this mechanism the motor-less design can be realized. An exploded view of the mechanism is shown in Fig. 2-19. A description of the operation is made below along with Fig. 2-19. To press-fit the cassette tape after sending it onto the mechanism chassis, the PINION GEAR section is triple construction. The FRONT LOAD RACK side and the IDLER GEAR side are independently engaged. The PINION GEAR and the LOCK GEAR are connected from the PINION LEVER PIN riveted to the PINION LEVER. Even after feeding the cassette tape to the specified position of the mechanism chassis, the FRONT LOAD RACK slides, giving the rotation to the PINION GEAR which is engaged with the FRONT LOAD RACK. At that time, a pin is dropped into the groove section provided on the GEAR BRACKET ASS'Y.

The other LOCK GEAR is fixed by this PINION LEVER PIN, and the cassette tape is press-fitted onto the mechanism chassis by linked IDLER GEAR. The before-mentioned FRONT LOAD RACK and the PINION GEAR are set free after dropping the PINION LEVER PIN into the groove section. So, the drive force of the loading motor is sent to the mechanism body.

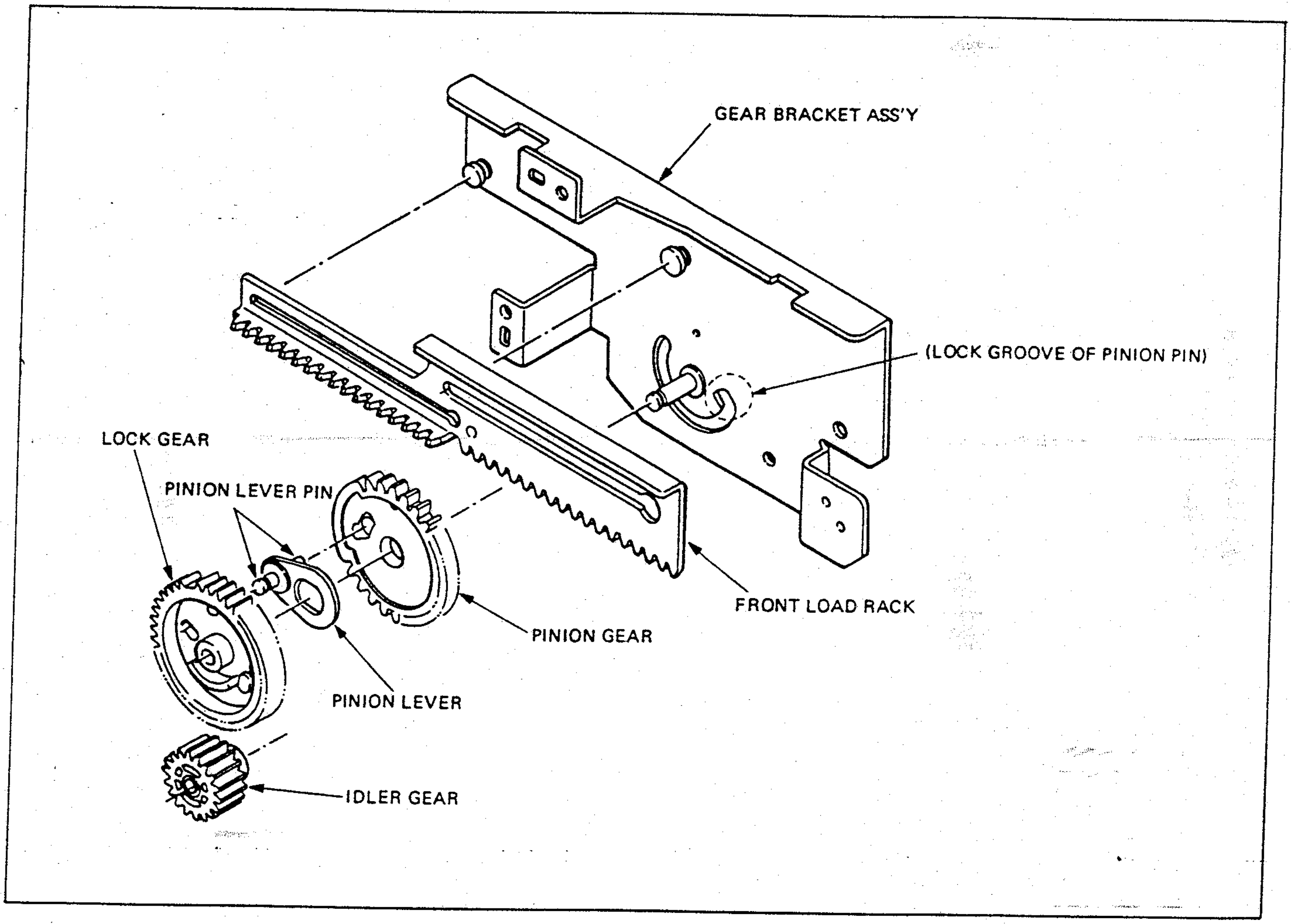


Fig. 2-19 RACK LOADING MECHANISM OF CASSETTE HOLDER

3. MECHANISM CONTROL

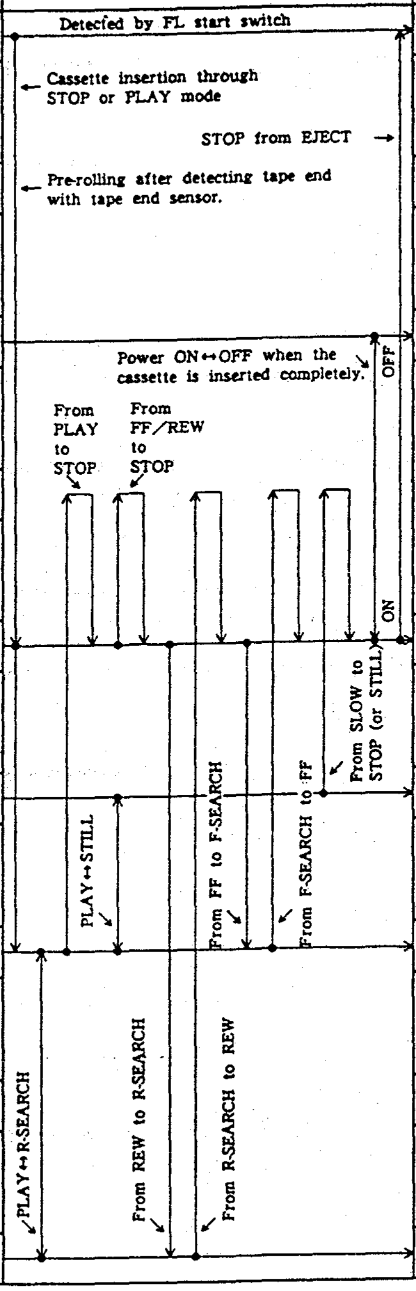
3-1. MODE ARRANGEMENT

This mechanism is arranged in such a mode layout as shown in Table. 3-1 and as described in section 2-1. The mode sensing switch described below is used for control of these modes.

3-2. MODE DETECTION SWITCH

For mode detecting two leaf switches (FL START SWITCH and FL END SWITCH), and one rotary switch (MECHANISM MODE SWITCH) are used in combination.

Main Mode Shifting Conditions



Detected by FL start switch
Cassette insertion through STOP or PLAY mode
STOP from EJECT
Pre-rolling after detecting tape end with tape end sensor.
Power ON↔OFF when the cassette is inserted completely.
OFF
ON
From PLAY to STOP
From FF/REW to STOP
From SLOW to STOP (or STILL)
PLAY↔STILL
From FF to F-SEARCH
From F-SEARCH to FF
PLAY↔R-SEARCH
From REW to R-SEARCH
From R-SEARCH to REW

Mechanism Mode	Mechanism Mode Switch 3	2	1	HEX DATA	Function	VTR Operation Mode
EJECT	–	–	–		Eject position	EJECT
					Front loading/Unloading	
SHORT REW	–	–	–		Take up operation in the tape end position	Detected by FL END switch
INITIAL	1	1	1	⑦	Power off position	Power off when tape is loaded completely
					Tape unloading position Tape loading Tape loading ending position	
BRAKE	0	0	1	①	Main brake applying position	
STOP / FF/REW	0	1	0	②	STOP waiting and FF/REW (the head motor rotation)	STOP, FF/REW
STILL	0	1	1	③	The positions of STILL, SLOW or F-ADV.	STILL, SLOW, F-ADV
PLAY	1	0	0	④	From FWD direction Normal running mode	PLAY, REC, F-SEARCH
IDLER	1	0	1	⑤	Forward/reverse changeover position	PAUSE
REV	1	1	0	⑥	From REV direction Normal running mode	R-SERACH

Table 3-1

(1) Switch component
The mode switch consists of FL START SWITCH for detecting the cassette ejection and insertion, FL END SWITCH for detecting the cassette complete insertion position, that is short rewind position, and MECHANISM MODE SWITCH for detecting the each mode position of the mechanism. As can be understood from Fig. 3-1, the MECHANISM MODE SWITCH rotates in excess of 360 degrees. Therefore, the sensing of a signal from the MECHANISM MODE SWITCH is done by the leaf switch 2.

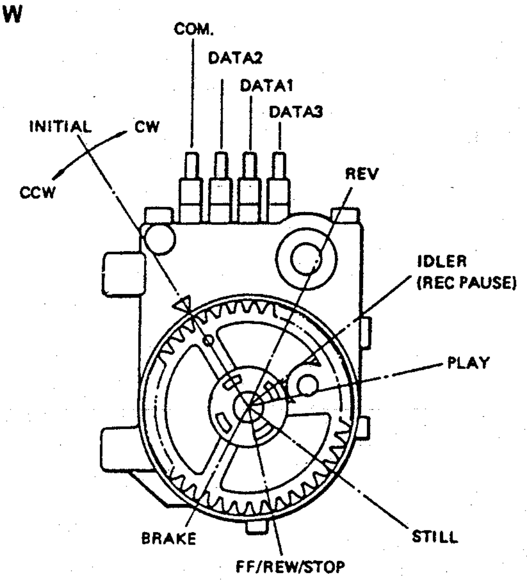
(2) Mechanism mode switch
The mechanism mode switch consists of four terminals, namely, COM, DATA1, DATA2, and DATA3. These are processed as 3-bit signals for discrimination of seven modes.

3-3. CONSIDERATION TO FULL LOADING

① In the normal stop condition, the head drum is rotated to facilitate the start-up of the image at the time of playback, but it is conceivable that this is left undisturbed for an extended period of time. This may result in wear of the video head. For this reason, when five minutes elapse from the stop condition, the head drum stops rotating.

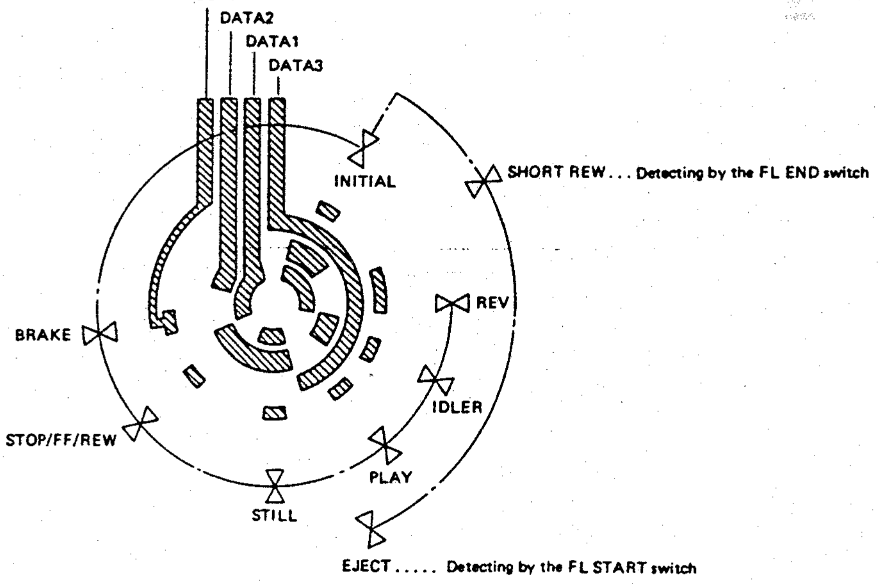
② To prevent the tape from being caught in the head drum due to dew forming, etc., the tape is housed in the unloaded cassette when turning the power off.

A. EXPLODED VIEW



COM.
DATA2
DATA1
DATA3
INITIAL
CW
CCW
REV
IDLER
(REC PAUSE)
PLAY
BRAKE
FF/REW/STOP
STILL

B. CONSTRUCTION OF INSIDE SWITCH



COM.
DATA2
DATA1
DATA3
INITIAL
SHORT REW... Detecting by the FL END switch
REV
BRAKE
IDLER
STOP/FF/REW
PLAY
STILL
EJECT..... Detecting by the FL START switch

Fig. 3-1 MECHANISM MODE SWITCH (ROTARY SWITCH)

4. MECHANISM MAINTENANCE AND CHECKING

4-1. PERIODIC CHECKING AND MAINTENANCE ITEMS AND SERVICE JIGS

The following maintenance and periodic checking procedures are recommended to ensure proper operation, and to protect the tape from dirt and damage. Also, these procedures should always be followed after repairing the unit.

4-1-1. Periodic Check Items

○ Cleaning ◎ Confirmation △ Lubrication

Part	Usage Time (hours)	500	1000	1500	2000	2500	3000	3500	4000	4500	5000	Remarks
Tape Guide System	Tape running surfaces	○	○	○	○	○	○	○	○	○	○	
	ACE head	○	○	○	○	○	○	○	○	○	○	
	Drum (cylinder)	○	○	○	○	○	○	○	○	○	○	Head life depends heavily on operating conditions.
Drive System	Loading belt	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	
	Reel drive belt	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	
	Intermediate gear, pulley axles		△		△		△		△		△	Absolutely avoid oil on tape running surfaces.
	Capstan axles		△		△		△		△		△	
	Loading motor		◎		◎		◎		◎		◎	
Performance Check	Back tension torque		◎		◎		◎		◎		◎	42 ± 5gcm
	Brake system		◎		◎		◎		◎		◎	
	FWD, REW, PLAY torque		◎		◎		◎		◎		◎	FWD, REW : 800gcm and over PLAY (SP) : 80 to 150gcm

4-1-2. Cleaning

① Drum (COMPL CYLINDER) and Video Heads (See Fig. 4-1-1.)

1) Wrap a chamois leather around your finger and moisten it with methyl alcohol.
2) Move the chamois leather to left and right several times on the video head to clean. There is a video head also on the opposite side, so clean it likewise. In Hi-Fi models, clean the audio head also.
3) Clean the tape path surface of the cylinder in the same way.

Note : Always turn power off before cleaning. Do never move the chamois leather vertically or apply too much force to the head ; it may be damaged.

② Cleaning of the Tape Guide System (See Fig. 4-1-2.)

1) Set the EJECT mode and clean the tape guide system (tape guides, impedance roller, FTE head, ACE head, pinch rollers, capstan axles, etc.) with a chamois leather moistened with methyl alcohol.

Note : Make sure that no oil, grease, etc. adhere to the chamois leather and that heads are not damaged.

③ Cleaning of the Drive System

1) Clean the drive system (loading belt, reel drive belt, pulley, supply reel table, etc.) with a soft cloth moistened with methyl alcohol.

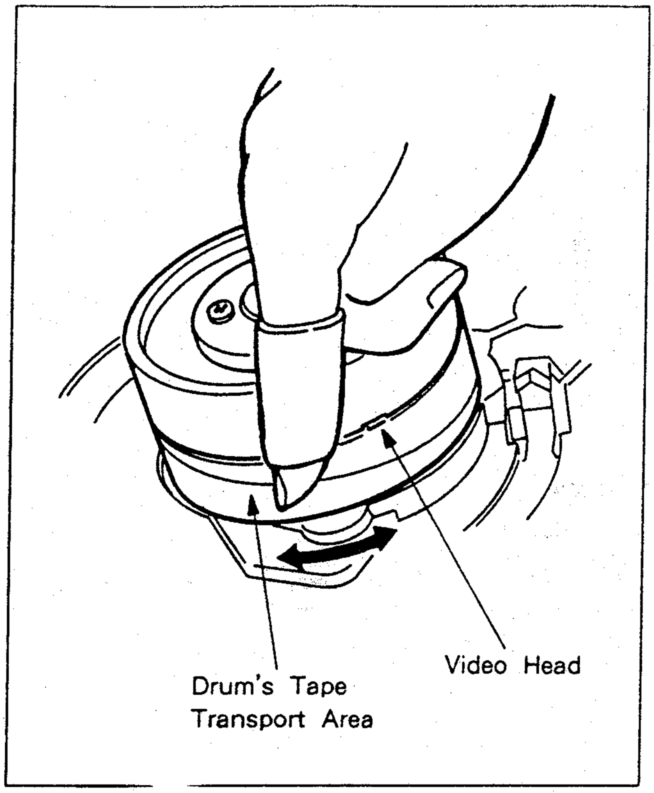

Video Head
Drum's Tape Transport Area

Fig. 4-1-1.

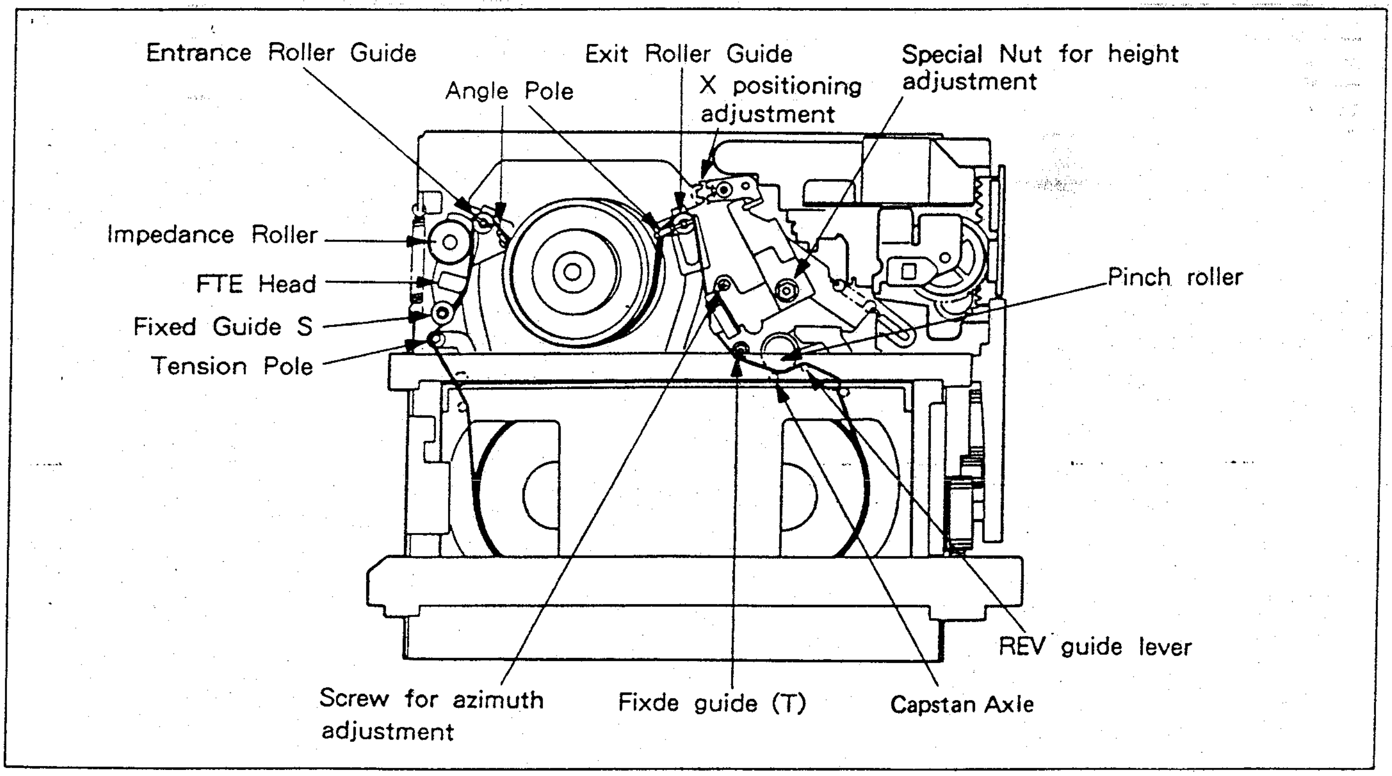
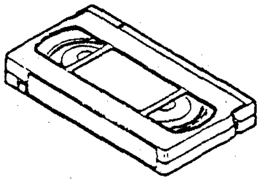
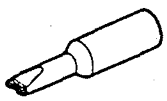
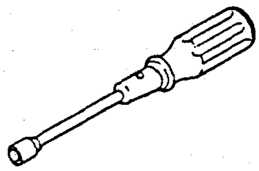
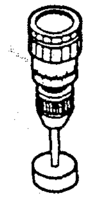
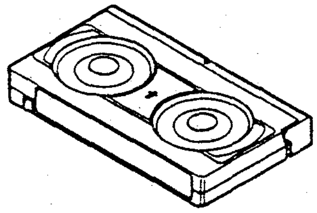
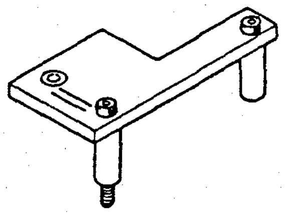
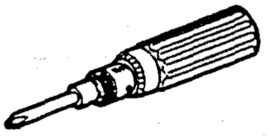
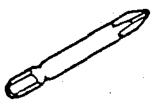
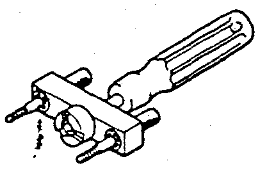
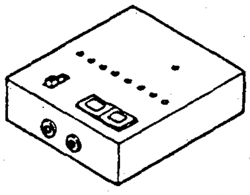
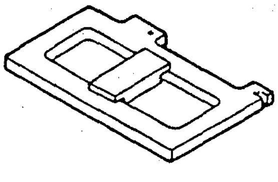
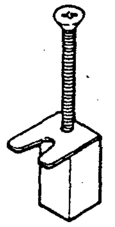

Entrance Roller Guide
Angle Pole
Exit Roller Guide
X positioning adjustment
Special Nut for height adjustment
Impedance Roller
FTE Head
Fixed Guide S
Tension Pole
Pinch roller
REV guide lever
Screw for azimuth adjustment
Fixde guide (T)
Capstan Axle

Fig. 4-1-2. Cleaning

4-1-3. Service Jigs

No.	Jig	Jig No.	Remarks
1	Alignment tape	VHJ-0008	SP color bar, 1kHz (normal)
2	Alignment tape	VHJ-0009	SP monoscope, 7kHz (normal)
3	Alignment tape	VHJ-0052	LP monoscope, 3kHz (normal)
4	Eccentric screwdriver	VHJ-0003	For tape path adjustment
5	Nut box	VHJ-0048	For tape path adjustment
6	Torque gauge	VHJ-0004	For reel take-up torque measurement
7	Cassette torquemeter	VHJ-0016	For back tension torque measurement
8	Position adjustment gauge	VHJ-0049	For position adjustment
9	Torque gauge screwdriver	VHJ-0014	For screw fastening torque adjustment
10	3mm dia. bit for torque screwdriver	VHJ-0045	Spare bit for the torque gauge screwdriver
11	Video head removing tool	VHJ-0041	For upper drum removal
12	Mode selector	VHJ-0050	For mechanism mode selection
13	Cassette stand plate gauge	VHJ-0001	For reel height adjustment
14	Fixed guide height gauge	VHJ-0053	For fixed guide (S) height adjustment

VHJ-0008, VHJ-0009, VHJ-0052  No. 1, 2, 3	VHJ-0003  No. 4	VHJ-0048  No. 5	VHJ-0004  No. 6
VHJ-0016  No. 7	VHJ-0049  No. 8	VHJ-0014  No. 9	VHJ-0045  No. 10
VHJ-0041  No. 11	VHJ-0050  No. 12	VHJ-0001  No. 13	VHJ-0053  No. 14

4-2. MODE SELECTOR (VHJ-0050) HANDLING INSTRUCTIONS

The mode selector drives the loading motor of the P88 mechanism with its internal batteries (UM-2 × 4 = 6V), using LEDS to indicate the mode (EJECT, INITIAL, BRAKE, STOP/REW/FWD, STILL, PLAY, IDLER, REV) simultaneously with EJECT⇔REV mode changes.
Instead of the internal batteries, an external DC 6V power supply can also be used.

4-2-1. Part Names (See Fig. 4-2-1)

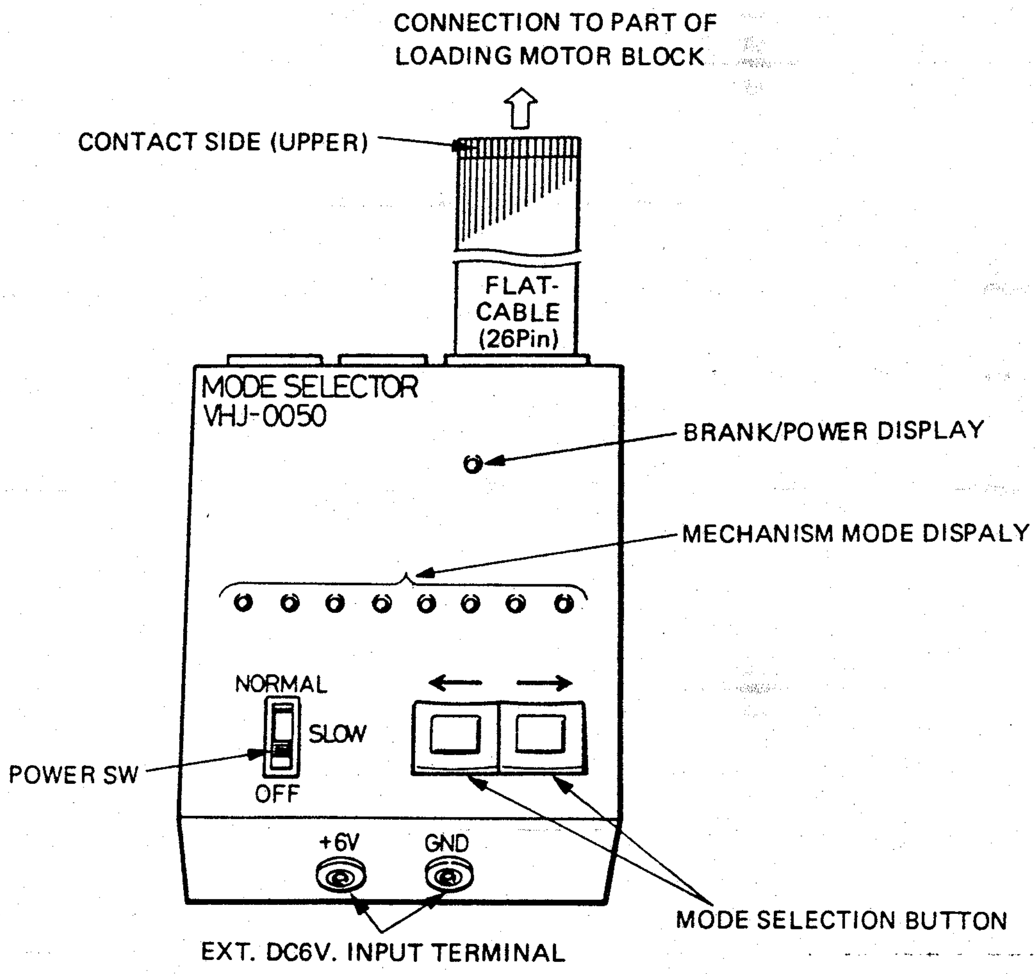

CONNECTION TO PART OF LOADING MOTOR BLOCK
CONTACT SIDE (UPPER)
FLAT-CABLE (26Pin)
MODE SELECTOR VHJ-0050
BRANK/POWER DISPLAY
MECHANISM MODE DISPALY
NORMAL
SLOW
OFF
POWER SW
+6V
GND
MODE SELECTION BUTTON
EXT. DC6V. INPUT TERMINAL

Fig. 4-2-1

4-2-2. Connection (See Fig. 4-2-2)

1) Remove the flexible flat cable connected to the socket (CN812) on the COMPL MC-2 board.
2) Connect the flexible flat cable from the mode selector to the socket (CN812) on the COMPL MC-2 board mentioned in 1).

Note : When connecting, be sure to place the contact surface of the flexible flat cable in the proper direction.

4-2-3. Handling

1) Keep the right side (⇨) of the mode selector key pressed, and the mode will change in the following sequence : EJECT⇨INITIAL⇨BRAKE⇨STOP/REW/FWD⇨STILL⇨PLAY⇨IDLER⇨REV.
2) When changing the mode in the REV···⇨EJECT direction, press the Left side (⇦) of the mode selector key until the desired mode is indicated.
3) At intermediate positions between modes, the "BLANK" LED lights up (When the mode selector is not connected to the mechanism, the "BLANK" LED indicates that power is on).
4) The SLOW position of the POWER switch allows for a slower operation than the NORMAL position.

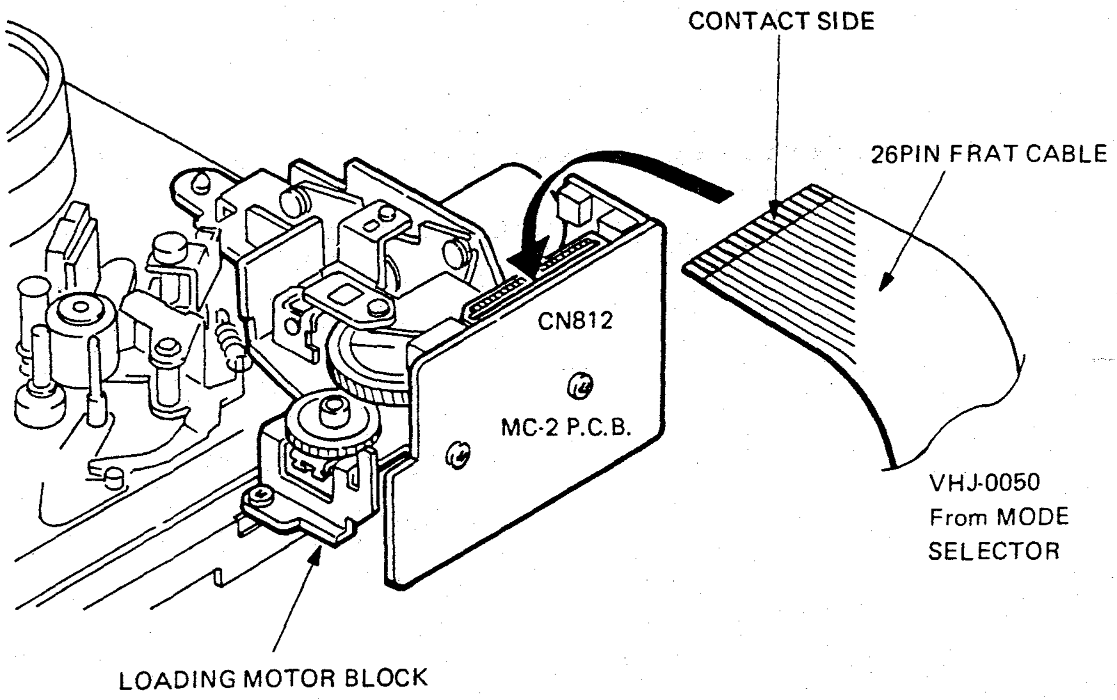


Fig. 4-2-2

Note 1 : The mode selector drives the loading motor only, not affecting the head drum motor and the capstan motor. When using the mode selector with a cassette loaded, turn the capstan motor manually to remove tape slackness, preventing tape entanglement.

Note 2 : If the Left side (⇦) of the mode selector (VHJ-0050) key is kept pressed with the COMPL cassette mechanism removed, it might get past the EJECT position, causing the front helical gear and the front worm gear to get disengaged.

In this condition, since the front helical gear will not turn even if the right side (⇨) of the mode selector key is pressed, rotate (push) the front helical gear clockwise by hand and engage it with the front worm gear. In this condition, as there is a misalignment between the mechanism main body operation mode (indicated by the mode selector indicator lamps) and the front loading mechanism operation mode, keep the right side (⇨) of the mode selector key pressed until the front helical gear and the front loading gear of the front loading mechanism get back to the initial condition (Refer to A and B in Fig. 5-3-5 of section 5-3-2. Loading Motor).

When the front loading mechanism returns to the initial condition, operation mode of the whole mechanism gets back to normal, matching the mode shown by the mode selector indicator lamps (mode is not properly indicated, however, during eject).

Sometimes, engagement of the front helical gear with the front worm gear is delayed, operation mode of the mechanism main body gets too much ahead and the front loading mechanism mode cannot be switched to the initial condition. In that case, press the Left side (⇦) of the mode selector key, setting the mechanism main body operation mode back to EJECT (rotation of the mode cam and the MAIN CAM stops).

Note 3 : The mode selector indicator lamps show the mechanism operation mode, but the EJECT lamp may sometimes fail to indicate the actual mechanism operation mode.

When setting the mechanism to the EJECT or INITIAL mode for dismounting or reassembling, fine adjustment of the each gear and cam, etc., marking positions is required after the mode selector indicator lamp has lighted up. Perform this with the mode selector switch in the SLOW position.

5. MECHANISM DISMANTLING AND REASSEMBLING

5-1. MECHANISM MAIN UNIT (See Fig. 5-1-1.)

1. Removal

1) Remove the connectors of the COMPL MC-2, the COMPL MC-3 and the COMPL HEAD BRACKET.
2) Remove the flexible P.C.B. ① connecting the COMPL CYLINDER to the COMPL VP-1 ③ (See Fig. A).
3) Remove the two screws ②, then remove the COMPL VP-1 ③.
4) Remove the screw ④, then remove the PRE-AMP. BRACKET ⑤.
5) Remove the two screws ⑥.
6) Remove the three screws ⑦ and two screws ⑩, then lift up the mechanism main unit and remove it.
   Since the TRAY ⑧ obstructs removal of the two front screws ⑩, move the TRAY LOCK LEVER ⑨ in the direction of the arrow to unlock, then slide the TRAY ⑧ before removing the screws.

Note : Shape of the COMPL VP-1 ③ and the PRE-AMP. BRACKET ⑤ differ depending on the model.

2. Remounting

1) Mount the mechanism main unit onto the chassis with the three screws ⑦ and two screws ⑩.
2) Tighten the two screws ⑥.
3) Mount the PRE-AMP. BRACKET ⑤ with the two screws ④.
4) Mount the COMPL VP-1 ③ and the ground lug with the two screws ② (some models are not provided with a ground lug).
5) Insert the flexible P.C.B. ① into the connector of the COMPL VP-1.
6) Connect the connectors of the COMPL MC-2, COMPL MC-3 and COMPL HEAD BRACKET.

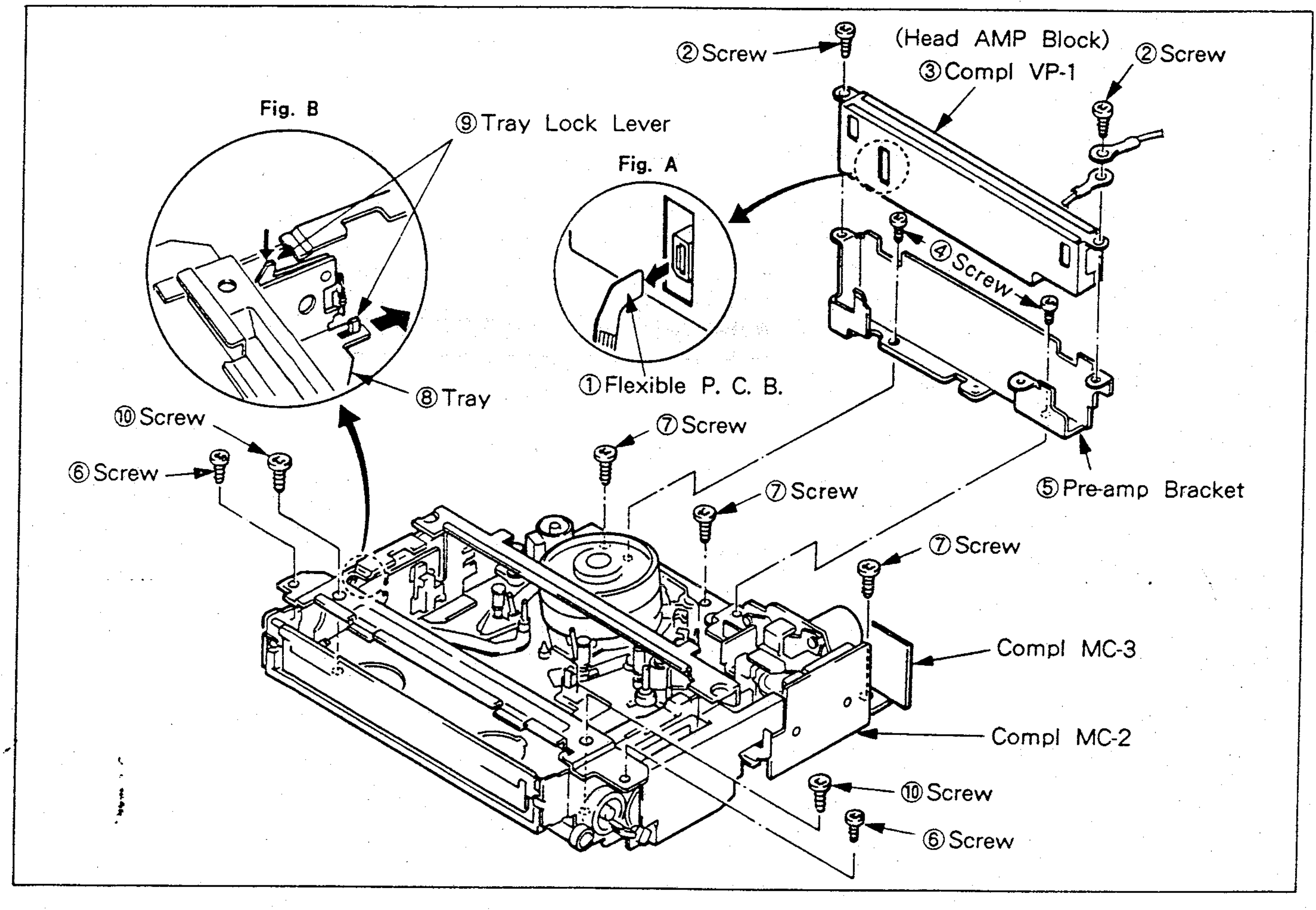

②Screw
(Head AMP Block)
③Compl VP-1
②Screw
Fig. B
⑨Tray Lock Lever
Fig. A
④Screw
⑧Tray
①Flexible P. C. B.
⑩Screw
⑦Screw
⑥Screw
⑦Screw
⑤Pre-amp Bracket
⑦Screw
Compl MC-3
Compl MC-2
⑩Screw
⑥Screw

Fig. 5-1-1 Mecahnism Main Unit

5-2. CASSETTE HOLDER MECHANISM

5-2-1. COMPL Cassette Mechanism (See Fig. 5-2-1.)

1. Removal

1) Set the video main unit to the EJECT completed mode.
2) Remove the connectors connected to the COMPL MC-2, the ACE head and the FTE head.
3) Remove the two screws ①.
4) Remove the two screws ②.
5) Lift up the COMPL CASSETTE MECHANISM ④ back a little and remove the two hooks ③ on the front (See Fig. B). When doing so, make sure that the SAFETY SWITCH LEVER is not caught by the mechanism chassis.

2. Remounting

1) Set the chassis section mechanism to the EJECT mode with the mode selector (VHJ-0050) (looking from above, match the front loading gear hole ⑤ with the FRONT BRACKET ASS'Y hole ⑥ as shown in Fig. A).
2) Set the COMPL CASSETTE MECHANISM ④ to the EJECT completed mode.
3) Mount the COMPL CASSETTE MECHANISM ④ onto the mechanism chassis, aligning it with the protuberance.
   Match positions of the FRONT LOADING GEAR △ mark ⑦ and the RACK EJECT mark ⑧.
4) Fix to the mechanism chassis with the two screws ②.
5) Fix to the chassis with the screw ①.
6) Connect to the various connectors.

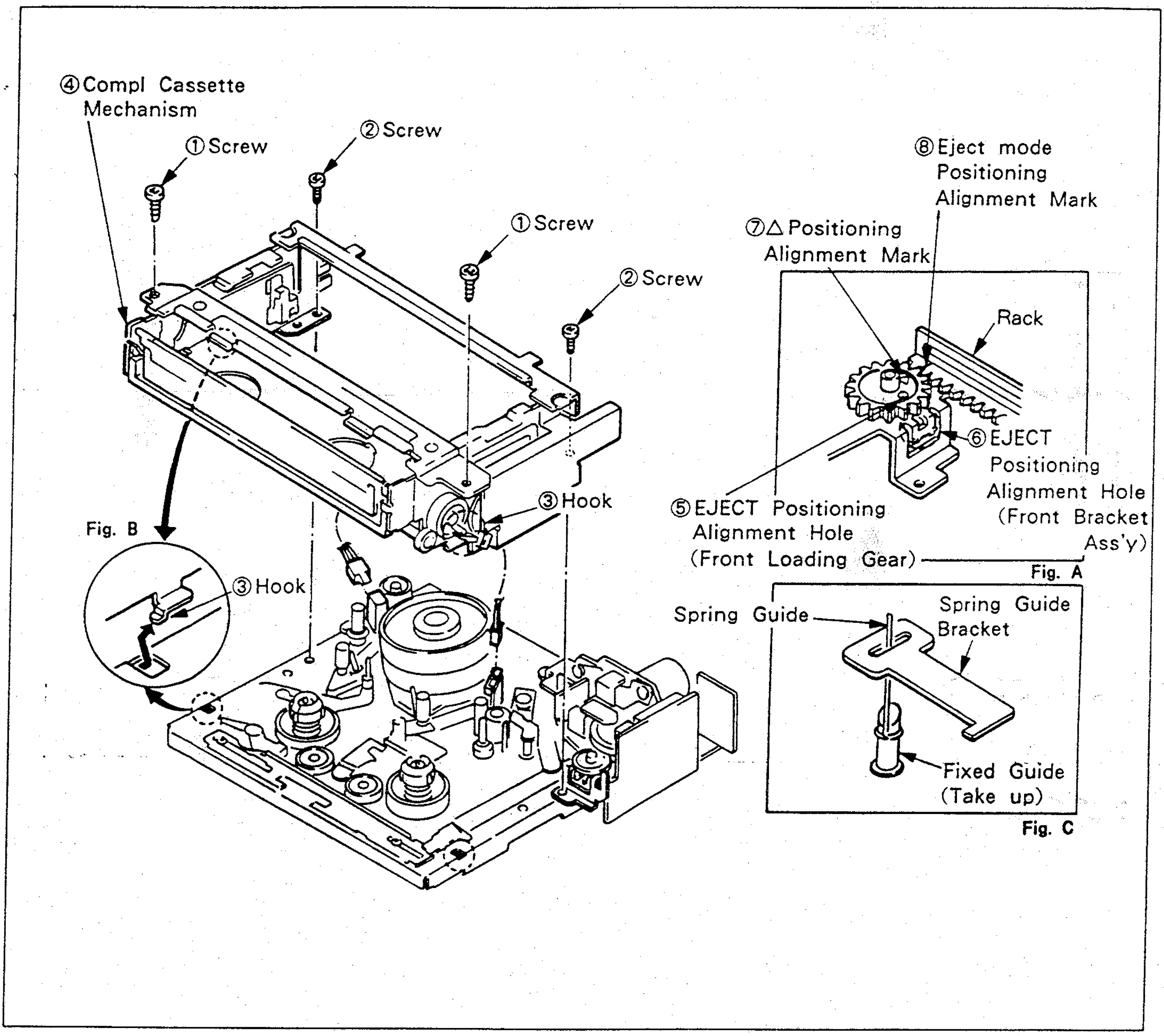

④Compl Cassette Mechanism
①Screw
②Screw
①Screw
②Screw
③Hook
Fig. B
③Hook
⑧Eject mode Positioning Alignment Mark
⑦△ Positioning Alignment Mark
Rack
⑥EJECT Positioning Alignment Hole (Front Bracket Ass'y)
⑤EJECT Positioning Alignment Hole (Front Loading Gear)
Fig. A
Spring Guide
Spring Guide Bracket
Fixed Guide (Take up)
Fig. C

Fig. 5-2-1 Compl Cassette Mechanism

5-2-2. Gear Bracket Ass'y (See Fig. 5-2-2.)

1. Removal

1) Remove the COMPL CASSETTE MECHANISM as instructed in 5-2-1.
2) Remove the four screws ①, then remove the GEAR BRACKET ASS'Y ②.
3) Remove the E ring ③, then remove the LOCK GEAR ④, the PINION LEVER ASS'Y ⑤, the PINION GEAR ⑥ and the RACK ⑦, in that order.

2. Remounting

1) Apply grease to the shaft ⑧ and the two pins ⑨ of the GEAR BRACKET ASS'Y.
2) Apply grease to the pin ⑩ of the PINION LEVER ASS'Y.
3) Apply grease to the toothed part of the RACK ⑦.
4) Fit the RACK ⑦ onto the two pins ⑨. Match position of the hole ⑪ to the GEAR BRACKET hole ⑫.
5) Mount the PINION GEAR ⑥, the PINION LEVER ASS'Y ⑤ and the LOCK GEAR ④ onto the axle ⑧, in that order.
   Do it so that the PINION GEAR and LOCK GEAR HOLE ⑬ is aligned with the GEAR BRACKET hole ⑫.
6) Mount the E ring onto the axle ⑧.
7) Mount the GEAR BRACKET ASS'Y with the four screws ①, aligning it with the protuberance.
   When doing so, make sure that RACK and GEAR do not get misplaced with regard to each other.
   Also confirm that the FL START SWITCH ⑭ is ON.
8) Remount the COMPL CASSETTE MECHANISM as instructed in 5-2-1.

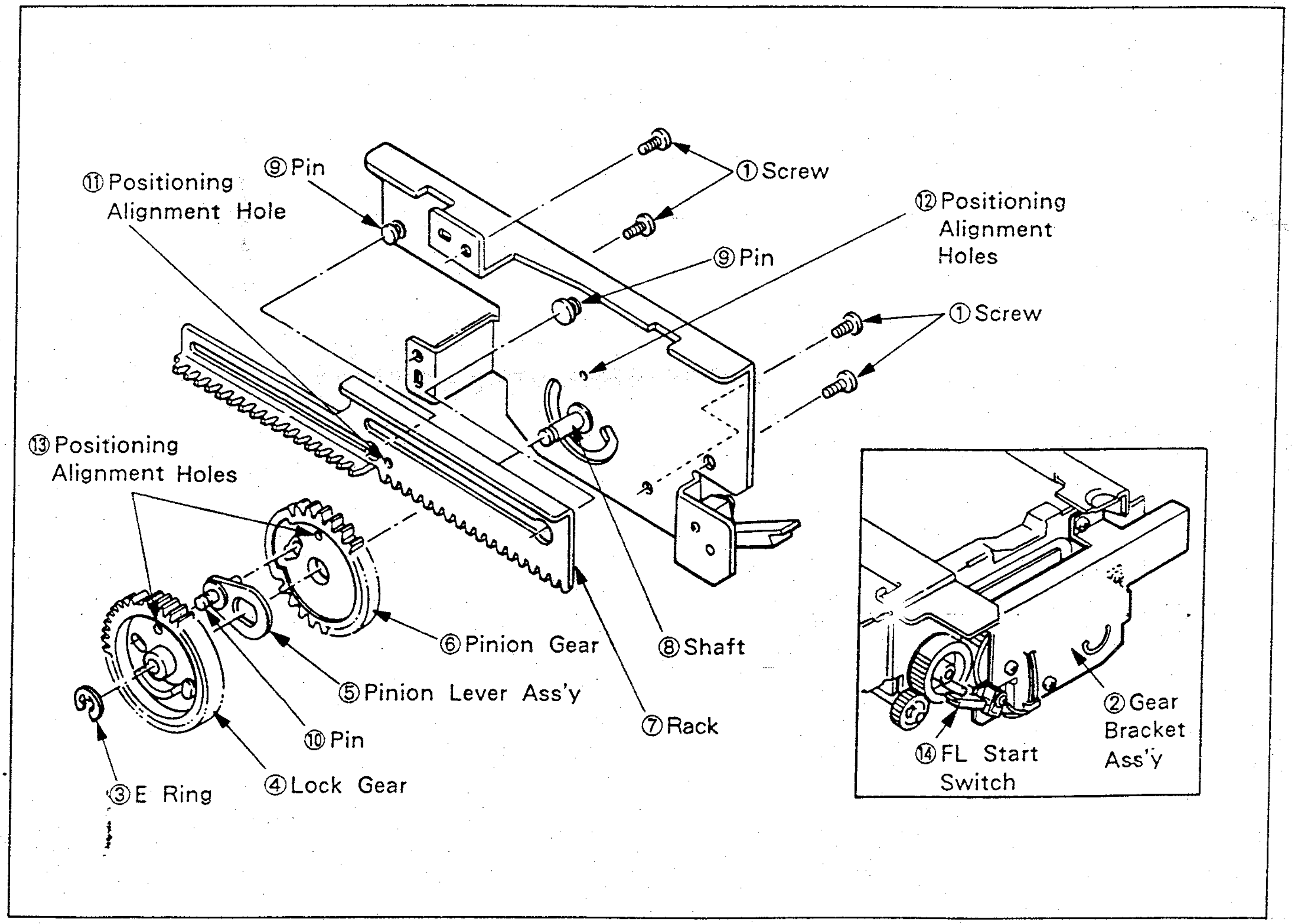

⑪ Positioning Alignment Hole
⑨ Pin
① Screw
⑫ Positioning Alignment Holes
⑨ Pin
① Screw
⑬ Positioning Alignment Holes
⑥ Pinion Gear
⑧ Shaft
⑤ Pinion Lever Ass'y
⑦ Rack
⑩ Pin
③ E Ring
④ Lock Gear
② Gear Bracket Ass'y
⑭ FL Start Switch

Fig. 5-2-2. **Gear Bracket Ass'y**

5-2-3. Cassette Drive Gear (Right) (See Fig. 5-2-3.)

1. Removal

1) Remove the COMPL CASSETTE MECHANISM and the GEAR BRACKET ASS'Y as instructed in 5-2-1. and 5-2-2., respectively.
2) Remove the IDLER GEAR ①.
3) Remove the SPRING COIL ②, then remove the MAIN GEAR ③.
4) Remove the E ring ④, then remove the LEVER GEAR ASS'Y R ⑤.
5) Open the hook ⑥ and remove the COUPLE GEAR R ⑦. Take care not to open the hook ⑥ too much, otherwise it may get deformed or broken. If it does, replace it.
6) Remove the IDLER GEAR R ⑧.

2. Remounting

1) Apply grease to gear parts that undergo friction.
2) Mount the IDLER GEAR R ⑧ onto the axle ⑨.
3) Mount the COUPLE GEAR R ⑦ onto the ROD ASS'Y axle ⑩. When doing so, match the couple gear position with the IDLER GEAR R ⑧ as shown in Fig. A.
4) Mount the LEVER GEAR ASS'Y R ⑤ onto the axles ⑪ and ⑫. Match position to the IDLER GEAR R ⑧ as shown in Fig. A.
5) Mount the E ring ④ onto the axle ⑫.
6) Mount the MAIN GEAR ③ onto the axle ⑪. When doing so, match position to the IDLER GEAR R ⑧ as shown in Fig. A.
7) Hook the SPRING COIL ② to the notch ⑬ in the MAIN GEAR R ③ and the LEVER GEAR ASS'Y R.
8) Mount the IDLER GEAR ① onto the axle ⑭. When doing so, match position to the MAIN GEAR as shown in Fig. A.
9) Mount the GEAR BRACKET ASS'Y and the COMPL CASSETTE MECHANISM ASS'Y as instructed in 5-2-2. and 5-2-1., respectively.

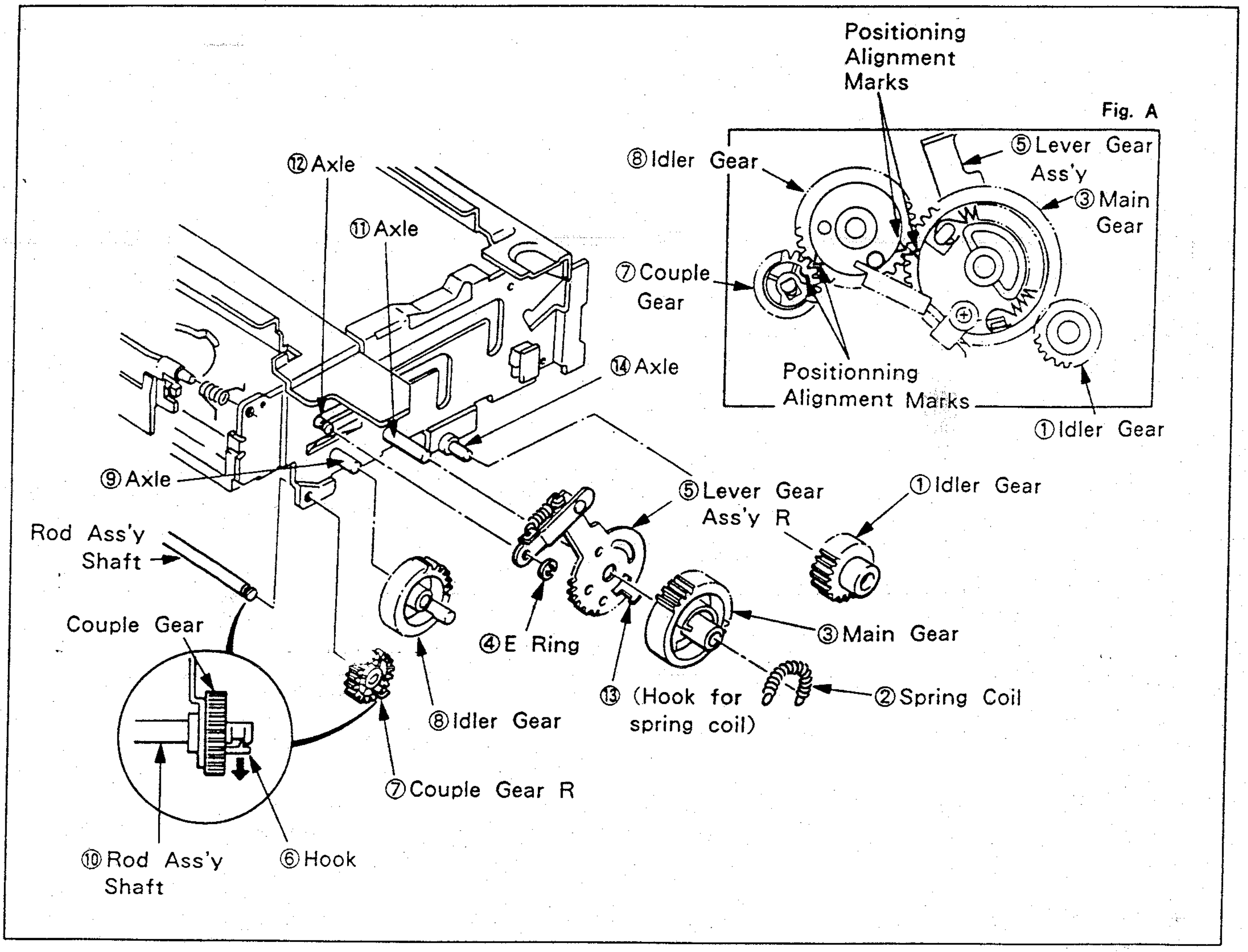

Positioning
Alignment
Marks
Fig. A
⑤Lever Gear Ass'y
③Main Gear
⑧Idler Gear
⑦Couple Gear
Positionning Alignment Marks
①Idler Gear
⑫Axle
⑪Axle
⑭Axle
⑨Axle
Rod Ass'y Shaft
Couple Gear
⑤Lever Gear Ass'y R
①Idler Gear
④E Ring
③Main Gear
⑧Idler Gear
⑬ (Hook for spring coil)
②Spring Coil
⑦Couple Gear R
⑩Rod Ass'y Shaft
⑥Hook

Fig. 5-2-3. **Cassette Drive Gears (Right Side)**

5-2-4. Cassette Drive Gear (Left) (See Fig. 5-2-4)

1. Removal

1) Remove the COMPL CASSETTE MECHANISM as instructed in 5-2-1.
2) Remove the COUPLE GEAR R as instructed in 5-2-3.
3) Remove the ROD ASS'Y ①.
4) Remove the E ring ②.
5) Remove the hook ③, then remove the LEVER GEAR ASS'Y L ④. Take care not to open the hook ③ too much, otherwise it may get deformed or broken. If it does, replace it.
6) Remove the SPRING COIL ⑤ from the LEVER GEAR ASS'Y ④.
7) Remove the IDLER GEAR L ⑥ and the DOOR OPEN LEVER ⑦.

2. Remounting

1) Apply grease to the axles ⑧, ⑨ and ⑩.
2) Apply grease to the IDLER GEAR L ⑥.
3) Mount the DOOR OPEN LEVER ⑦ onto the axle ⑧. Do it so that the end of the DOOR OPEN LEVER ⑦ leans against the front side of the CASSETTE DOOR ⑪ as shown in Fig. A.
4) Mount the IDLER GEAR L ⑥ onto the axle ⑧.
5) Pass the ROD ASS'Y ① through the hole ⑫. Match position of the COUPLE GEAR L ⑬ and the IDLER GEAR L ⑥ as shown in Fig B.
6) Mount the COUPLE GEAR R as instructed in 5-2-3.
7) Hook the SPRING COIL ⑤ to the LEVER GEAR ASS'Y L ④.
8) Mount the LEVER GEAR ASS'Y L ④ onto the axle ⑨ and the shaft ⑩. Match position to the IDLER GEAR L ⑥ as shown in Fig. B.
9) Mount the COMPL CASSETTE MECHANISM onto the chassis as instructed in 5-2-1.

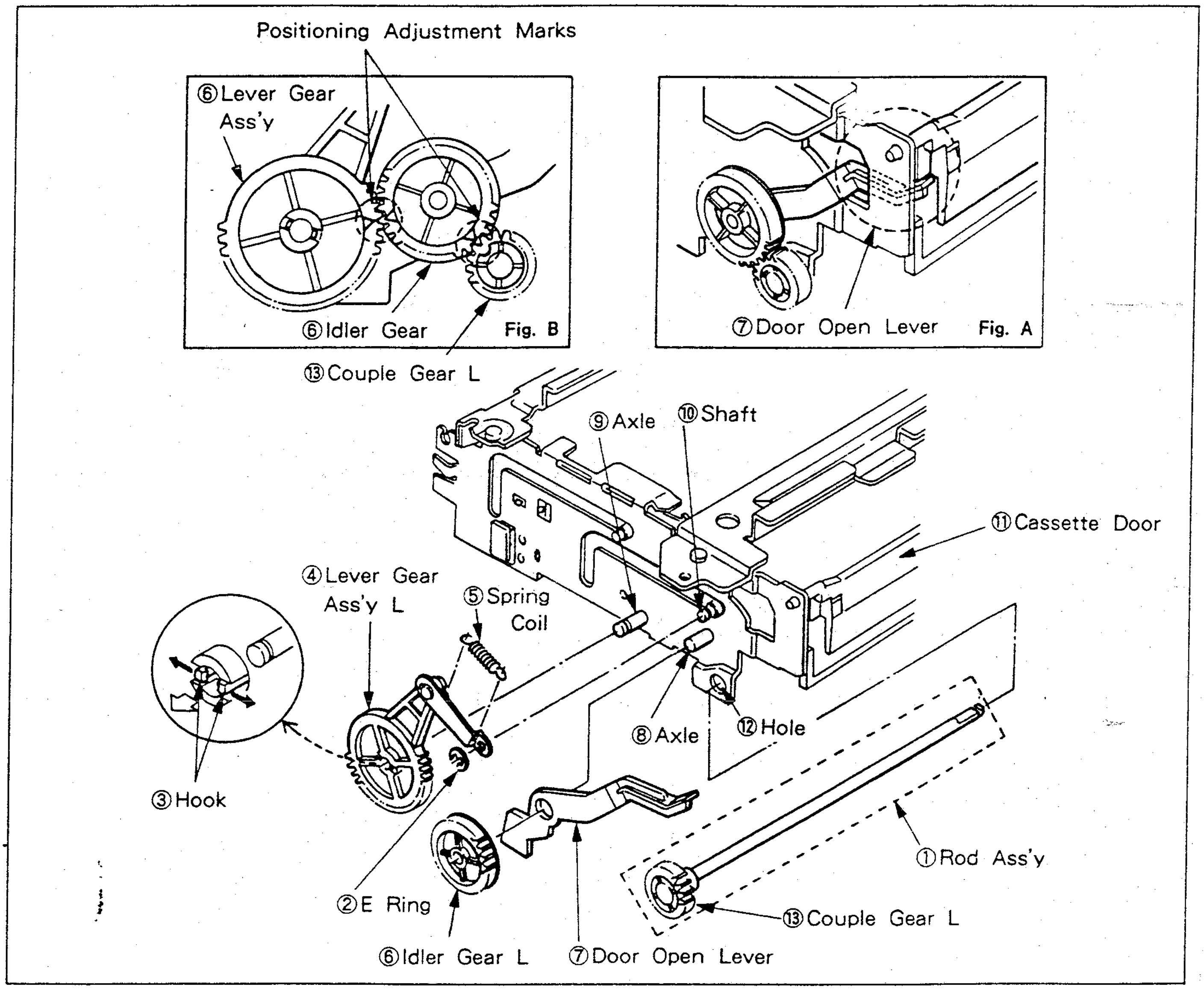

Positioning Adjustment Marks
⑥Lever Gear Ass'y
⑥Idler Gear
Fig. B
⑬Couple Gear L
⑦Door Open Lever
Fig. A
⑨Axle
⑩Shaft
⑪Cassette Door
④Lever Gear Ass'y L
⑤Spring Coil
⑧Axle
⑫Hole
③Hook
①Rod Ass'y
②E Ring
⑬Couple Gear L
⑥Idler Gear L
⑦Door Open Lever

Fig. 5-2-4. Cassette Drive Gears (Left Side)

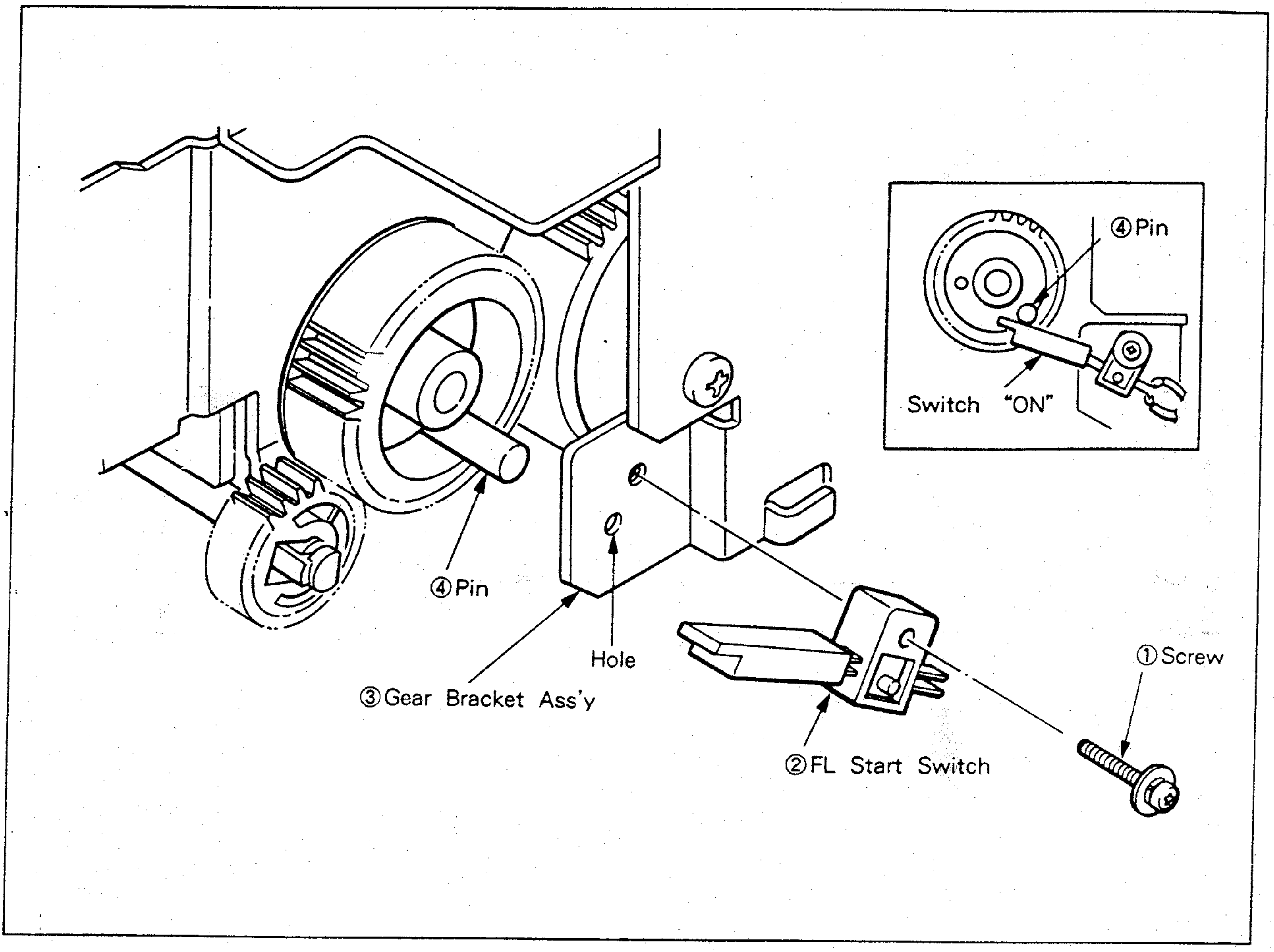
5-2-5. FL Start Switch (See Fig. 5-2-5.)

1. Removal

1) Remove the COMPL CASSETTE MECHANISM as instructed in 5-2-1.
2) Remove the screw ①.
3) Remove the lead wire of the FL START SWITCH ②.

2. Remounting

1) Solder the lead wire to the FL START SWITCH ② terminal.
2) Align the FL START SWITCH ② protuberance to the hole, then mount it onto the GEAR BRACKET ASS'Y ③ with the screw ①. Do it so that the FL START SWITCH ② is turned ´ON by holding the pin ④ of IDLER GEAR in the EJECT completed mode.
3) Mount the COMPL CASSETTE MECHANISM as instructed in 5-2-1.


④Pin
Switch "ON"
④Pin
Hole
③Gear Bracket Ass'y
①Screw
②FL Start Switch

5-2-5. FL Start Switch

5-2-6. T-Top Sensor, T-End Sensor (See Fig. 5-2-6.)

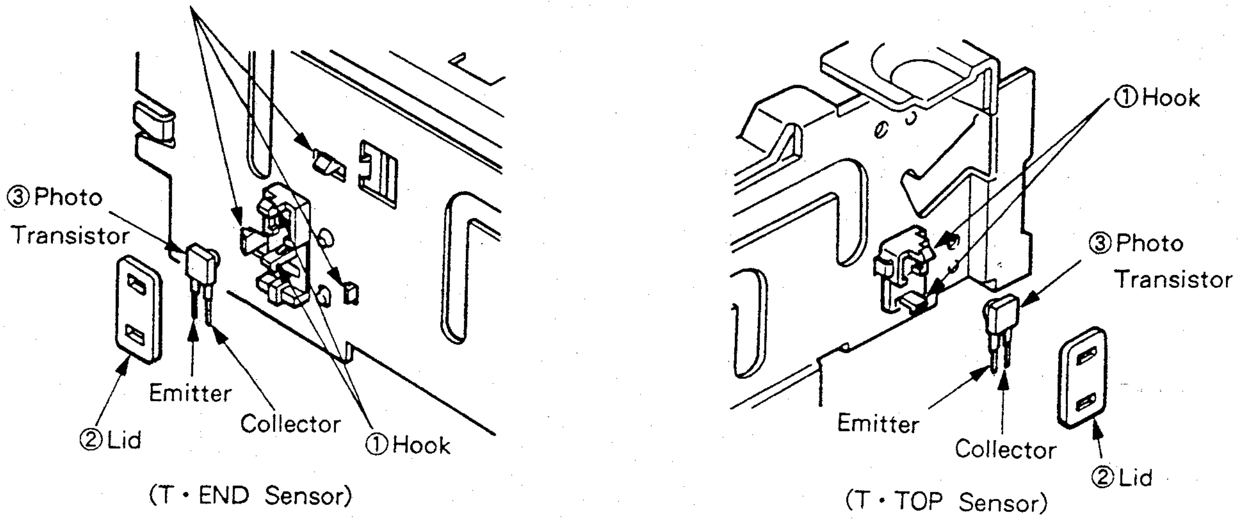
1. Removal

1) Remove the COMPL CASSETTE MECHANISM as instructed in 5-2-1.
2) When removing the T-TOP SENSOR, remove the GEAR BRACKET ASS'Y as instructed in 5-2-2.
3) Unhook the hook ① as instructed in Fig. A, then remove the LID ②. Take care not to push the hook ① too much, otherwise it may be deformed or broken.
4) Remove the phototransistors ③, then remove the lead wire.

Note : Mounting position of the transistor holder on the T-END SENSOR side is precisely adjusted at the factory, so do never remove it from the COMPL CASSETTE MECHANISM.

2. Remounting

1) Solder the brown lead wire to the emitter side, and the red lead wire to the collector side of the T-TOP SENSOR phototransistor ③.
   Solder the orange lead wire to the emitter side, and the yellow lead wire to the collector side of the T-END SENSOR phototransistor.
2) Mount the phototransistors ③ onto their respective holders.
3) Mount the LID ② and fix it with the hook ①.
4) Mount the GEAR BRACKET ASS'Y as instructed in 5-2-2.
5) Mount the COMPL CASSETTE MECHANISM as insturcted in 5-2-1.

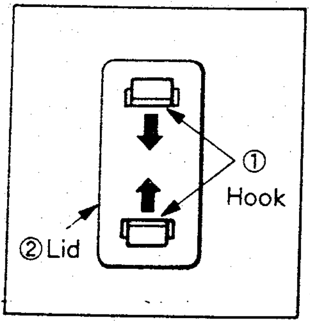


Do not remove the holder from the compl cassette mechanism.

(T · END Sensor)

(T · TOP Sensor)

Fig. A



5-2-6. T TOP Sensor & T END Sensor

5-3. COMPL MOTOR BRACKET (LOADING MOTOR BLOCK)

5-3-1. COMPL Motor Bracket

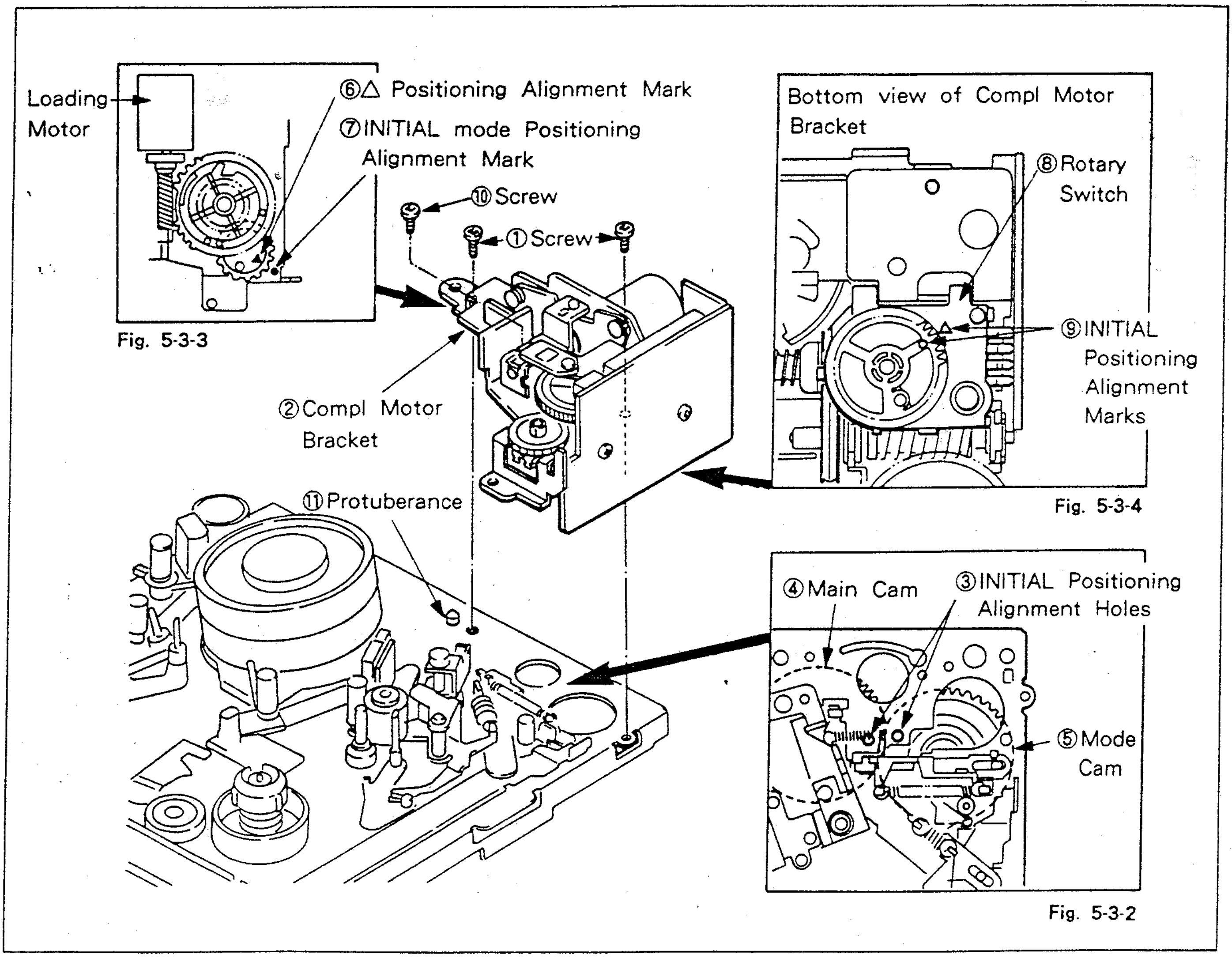
1. Removal

1) Remove the COMPL VP-1 and the PRE-AMP. BRACKET as instructed in 5-1.
2) Remove the COMPL CASSETTE MECHANISM as instructed in 5-2-1.
3) Remove the two screws ① and the other one ⑩, then remove the COMPL MOTOR BRACKET ② (see Fig. 5-3-1.).

2. Remounting

1) Set the mechanism chassis to the INITIAL mode. In this mode, look at the mechanism chassis positioning holes ③ just from above and align the MAIN CAM ④ and MODE CAM ⑤ positioning holes as shown in Fig. 5-3-2.
2) Set the COMPL MOTOR BRACKET to the INITIAL mode with the mode selector (VHJ-0050). In this position, the FRONT LOADING GEAR △ mark ⑥ is aligned with the FRONT BRACKET ASS'Y initial position mark ⑦ (see Fig. 5-3-3.).
3) Align the ROTARY SWITCH (mode detector switch) ⑧ with the INITIAL mode position mark ⑨ (see Fig. 5-3-4.).
4) Align the COMPL MOTOR BRACKET main unit ② with the protuberance ⑪, then mount it with the two screws ① and the other one ⑩.
5) Mount the COMPL CASSETTE MECHANISM as instructed in 5-2-1.
6) Mount the COMPL VP-1 and the PRE-AMP. BRACKET as instructed in 5-1.

Note : Normal mechanism operation cannot be achieved if initial positioning of the MAIN CAM ④, the MODE CAM ⑤ and the ROTARY SWITCH (mode detector switch) ⑧ are not performed precisely.


Loading Motor
Fig. 5-3-3
⑥△ Positioning Alignment Mark
⑦INITIAL mode Positioning Alignment Mark
⑩Screw
①Screw
②Compl Motor Bracket
⑪Protuberance
Bottom view of Compl Motor Bracket
⑧Rotary Switch
⑨INITIAL Positioning Alignment Marks
Fig. 5-3-4
④Main Cam
③INITIAL Positioning Alignment Holes
⑤Mode Cam
Fig. 5-3-2

5-3-1. Compl Motor Bracket

5-3-2. Loading Motor (See Fig. 5-3-5.)

1. Removal

1) Remove the COMPL VP-1 and the PRE-AMP. BRACKET as instructed in 5-1.
2) Remove the COMPL CASSETTE MECHANISM as instructed in 5-2-1.
3) Remove the COMPL MOTOR BRACKET as instructed in 5-3-1:
4) Remove the two screws ①, then remove the COMPL MC-2 ②.
5) Remove the COMPL MC-3 ③ DEW SENSOR connector.
6) Remove the special washer ④.
7) Remove the two screws ⑤ then remove the HOLDER BRACKET ⑥.
8) Remove the FRONT WORM ASS'Y ⑦, the washer ⑧ and the DAMPER ⑨.
9) Remove the washer ⑩ and the FRONT HELICAL GEAR ⑪.
10) Remove the lead wires from the LOADING MOTOR ⑫ terminals.
11) Remove the LOADING BELT ⑬.
12) Remove the two screws ⑭, then remove the STAND BRACKET ⑮.
13) Remove the three screws ⑯, then remove the MOTOR PLATE ⑱ with the MOTOR DAMPER ⑰ attached.
14) Remove the two screws ⑲, then remove the LOADING MOTOR ⑫.

Note 1 : When the WORM HOLDER has been removed, always replace it with a new one to prevent noise generation.

Note 2 : In some models, the COMPL MOTOR BRACKET is not provided with STAND BRACKET ⑮, MOTOR DAMPER ⑰ and MOTOR PLATE ⑱. Also, in some cases the LOADING MOTOR ⑫ is soldered directly to the COMPL MC-2.

2. Remounting

1) Mount the LOADING MOTOR ⑫ to the MOTOR PLATE ⑱ with the two screws ⑲.
2) After mounting the three MOTOR DAMPERS ⑰ onto the MOTOR PLATE ⑱, mount the latter onto the STAND BRACKET ⑮ with the three screws ⑯.
3) Mount the STAND BRACKET ⑮ onto the MOTOR BRACKET ASS'Y ⑳ with the two screws ⑭.
4) Fit the LOADING BELT ⑬ around the pulley.
5) Align the FRONT LOADING GEAR △ mark ㉑ with the FRONT BRACKET ASS'Y initial position mark ㉒ as shown in Fig. A.
6) Apply a thin layer of grease to the axle ㉓ and the whole side surface of the FRONT HELICAL GEAR ⑪.
7) Mount the FRONT HELICAL GEAR ⑪ and the washer ⑩ onto the axle ㉓. Do this so that the FRONT LEVER ASS'Y pin ㉔ gets into the FRONT HELICAL GEAR ⑪ side indent as shown in Fig. B.
8) Mount the DAMPER ⑨ and the FRONT WORM ASS'Y ⑦, in that order, onto the LOADING MOTOR ⑫.
9) Pass the washer ⑧ through the FRONT WORM ASS'Y AXLE ㉕.
10) Mount the HOLDER BRACKET ⑥ with the two screws ⑤, aligning it to the protuberance. the protuberance.
11) Mount the special washer ④ to the FRONT WORM ASS'Y AXLE ㉕.
12) Connect the COMPL MC-3 ③ DEW SENSOR connector.
13) Mount the COMPL MC-2 ② with the two screws ①.
14) Solder the lead wires to the LOADING MOTOR terminals (solder the red lead wire to the (+) terminal and the white lead wire to the (−) terminal).
15) Mount the COMPL MOTOR BRACKET (loading motor block) onto the mechanism chassis as instructed in 5-3-1.
16) Mount the COMPL CASSETTE MECHANISM as instructed in 5-2-1.
17) Mount the PRE-AMP. BRACKET and the COMPL VP-1 as instructed in 5-1.

Note 1 : Position gears precisely.

Note 2 : Always set the ROTARY SWITCH to the INITIAL position before mounting the COMPL MOTOR BRACKET onto the mechanism chassis.

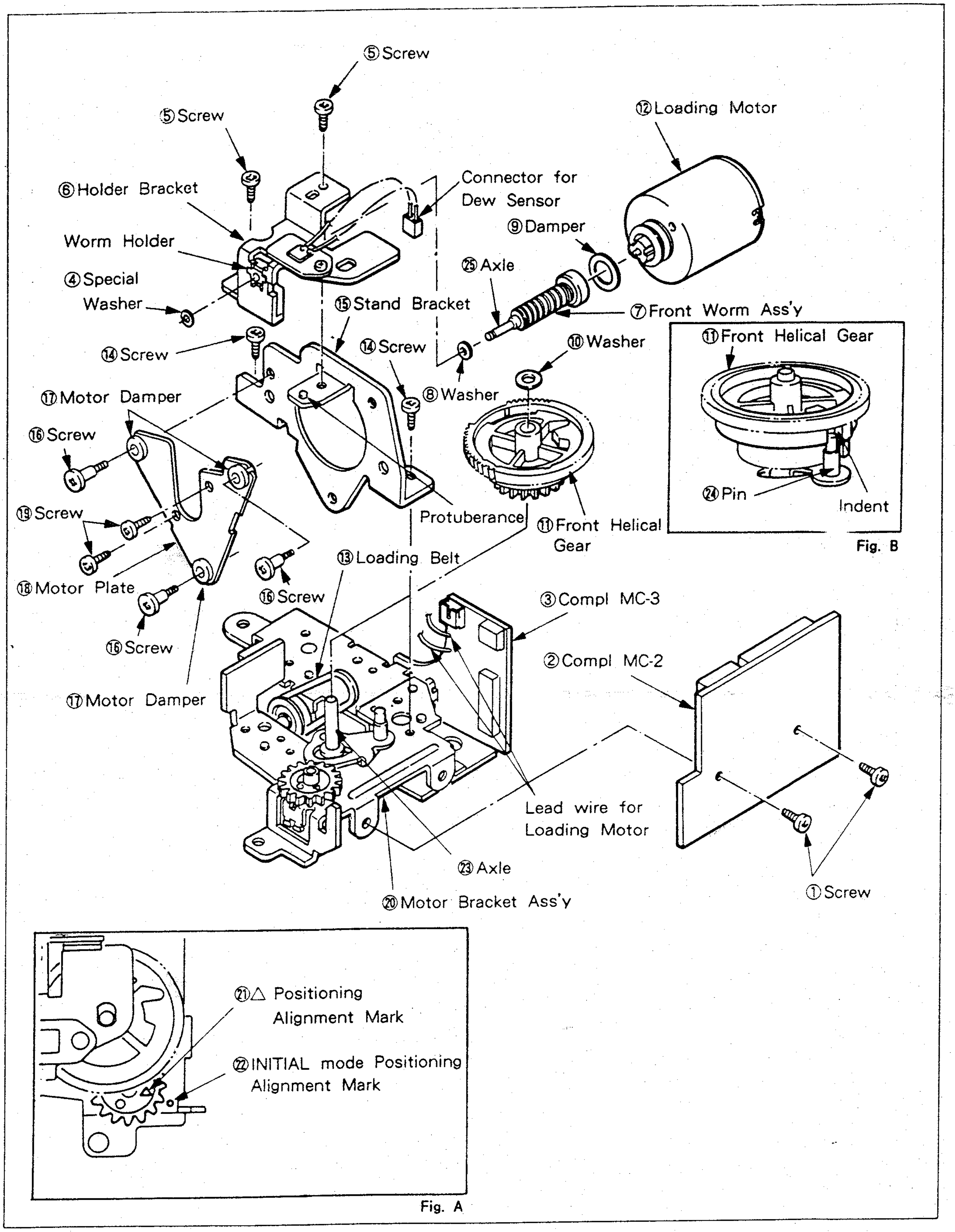

⑤Screw
⑤Screw
⑫Loading Motor
⑥Holder Bracket
Connector for Dew Sensor
Worm Holder
⑨Damper
④Special Washer
㉕Axle
⑮Stand Bracket
⑦Front Worm Ass'y
⑭Screw
⑭Screw
⑩Washer
⑪Front Helical Gear
⑰Motor Damper
⑧Washer
⑯Screw
⑲Screw
Protuberance
⑪Front Helical Gear
㉔Pin
Indent
Fig. B
⑬Loading Belt
⑱Motor Plate
⑯Screw
③Compl MC-3
⑯Screw
②Compl MC-2
⑰Motor Damper
Lead wire for Loading Motor
㉓Axle
①Screw
⑳Motor Bracket Ass'y
㉑△ Positioning Alignment Mark
㉒INITIAL mode Positioning Alignment Mark
Fig. A

Fig. 5-3-5. Loading Motor

5-5. COMPL HEAD BRACKET (ACE HEAD) (See Fig. 5-5-1.)

1. Removal

1) Remove the COMPL HEAD BRACKET special mounting nut ②.
2) Remove the SPACER ③, the COMPL HEAD BRACKET ① and the ACE HEAD SPRING COIL ④, in that order.

Note : Take care not to scratch or soil the ACE head surface.

2. Remounting

1) Apply grease to the axle ⑥ as shown in Fig. A.
2) Apply grease to the spot where the COMPL HEAD BRACKET ① makes contact with the STOPPER ⑦ (See Fig. A).
3) Mount the ACE HEAD SPRING COIL ④ and the COMPL HEAD BRACKET ①, in that order, onto the axle ⑥. Hook one end of the ACE HEAD SPRING COIL ④ to the notch ⑤, and the other end to the COMPL HEAD BRACKET, so that the COMPL HEAD BRACKET is pressed against the STOPPER ⑦ (See Fig. A).
4) Mount the SPECIAL NUT ② onto the axle ⑥ through the SPACER ③.
5) Clean the ACE head surface with a chamois leather moistened with methyl alcohol.
6) Perform ACE head adjustment as instructed in 6-4.

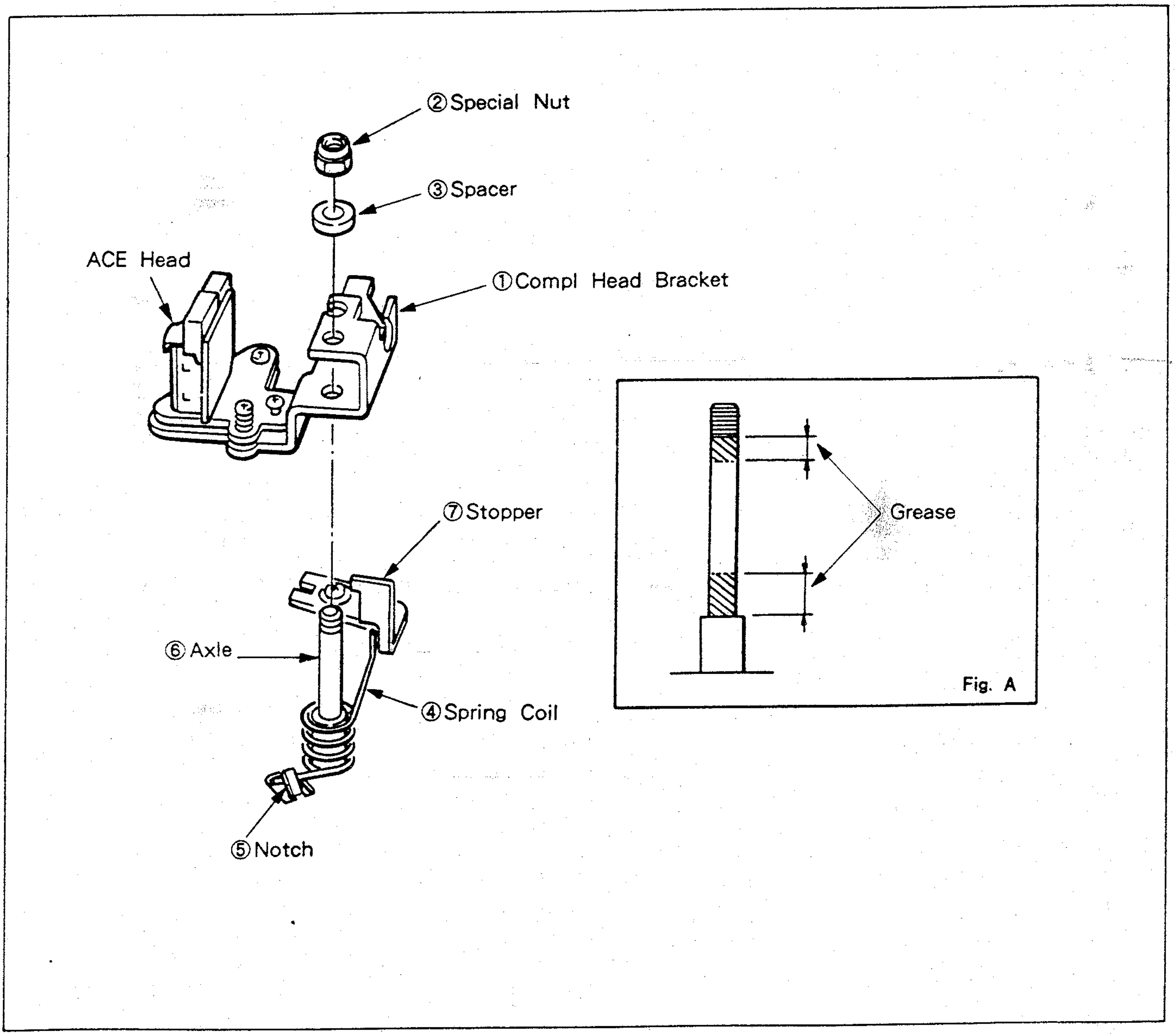

②Special Nut
③Spacer
ACE Head
①Compl Head Bracket
⑦Stopper
⑥Axle
④Spring Coil
⑤Notch
Grease
Fig. A

Fig. 5-5-1. Compl Head Bracket (ACE Head)

5-6. PINCH ROLLER PRESSURE MECHANISM (See Fig. 5-6-1.)

1. Removal

1) Remove the COMPL CASSETTE MECHANISM as instructed in 5-2-1.
2) Remove the COMPL HEAD BRACKET as instructed in 5-5.
3) Remove the PINCH SPRING COIL ①.
4) Remove the special washer ②, then remove the PINCH LEVER ASS'Y ③.
5) Remove the REV GUIDE LEVER SPRING COIL ④.
6) Remove the REV GUIDE LEVER ASS'Y ⑥ from the plastic molding bearing hook ⑤ at the bottom. Take care not to open the hook too much, otherwise it may be deformed or broken.
7) Remove the LINK LOCK SPRING COIL ⑦.
8) Remove the special washer ⑧, then remove the PINCH CAM LEVER ASS'Y ⑨.
9) Remove the ACT PINCH SLIDE ASS'Y ⑩.

2. Remounting

1) Apply grease to pins ⑫/⑬ and axles ⑯/⑱.
2) Apply grease to the ACT PINCH SLIDE ASS'Y pin ⑰.
3) Set the INITIAL mode with the mode selector (VHJ-0050).
4) Mount the ACT PINCH SLIDE ASS'Y ⑩ onto pins ⑫ and ⑬.
5) Insert the pin ⑭ of the PINCH CAM LEVER ASS'Y ⑨ into the MAIN CAM ⑪ GROOVE 1, and mount onto the axle ⑯ while inserting the pin ⑰ of the ACT PINCH SLIDE ASS'Y into the hole ⑮.
6) Mount the special washer ⑧ onto the axle ⑯.
7) Hook the LINK LOCK SPRING COIL ⑦ to the PINCH CAM LEVER ASS'Y ⑨.
8) Mount the REV GUIDE LEVER ASS'Y ⑥ to the plastic molding bearing, then fix it with the hook ⑤ at the bottom.
9) Hook the REV GUIDE LEVER SPRING COIL ④.
10) Mount the PINCH LEVER ASS'Y ③ to the axle ⑱.
11) Mount the special washer ② to the axle ⑱.
12) Hook the PINCH SPRING COIL ① between the ACT PINCH SLIDE ASS'Y ⑩ and the PINCH LEVER ASS'Y ③.
13) Mount the COMPL HEAD BRACKET as instructed in 5-5.
14) Mount the COMPL CASSETTE MECHANISM as instructed in 5-2-1.
15) Perform ACE head adjustment as instructed in 6-4.

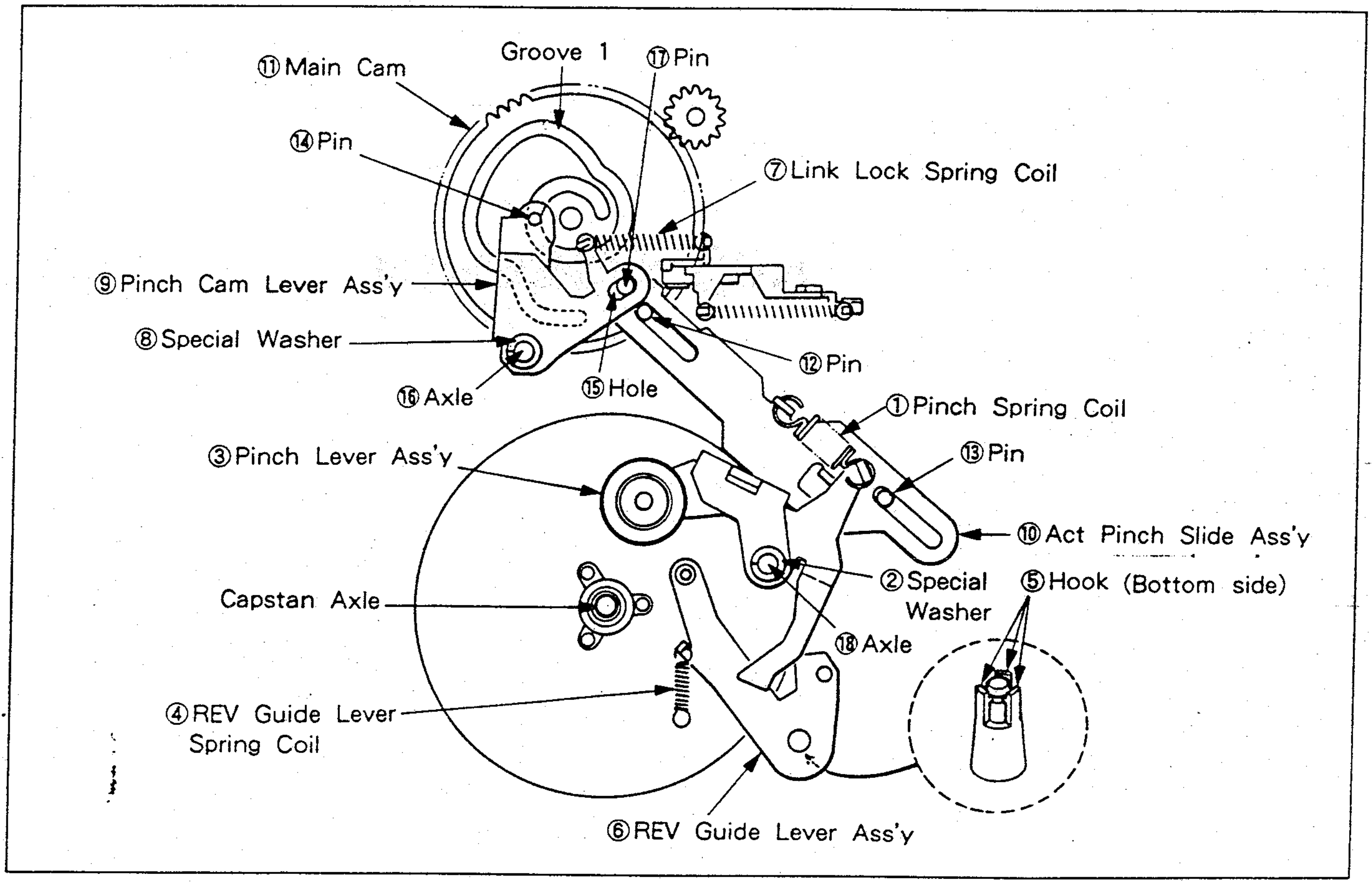

⑪Main Cam
Groove 1
⑰Pin
⑭Pin
⑦Link Lock Spring Coil
⑨Pinch Cam Lever Ass'y
⑧Special Washer
⑫Pin
⑯Axle
⑮Hole
①Pinch Spring Coil
③Pinch Lever Ass'y
⑬Pin
⑩Act Pinch Slide Ass'y
②Special Washer
⑤Hook (Bottom side)
Capstan Axle
⑱Axle
④REV Guide Lever Spring Coil
⑥REV Guide Lever Ass'y

Fig. 5-6-1. Pinch Roller Pressing Mechanism

5-7. BRAKE MECHANISM

5-7-1. Sub Take-up Brake Ass'y (See Fig. 5-7-1.)

1. Removal

1) Remove the COMPL CASSETTE MECHANISM as instructed in 5-2-1.
2) Remove the SPRING COIL ①.
3) While pushing the hook ② in the direction of arrow, remove the SUB TAKE-UP BRAKE ASS'Y ③.

2. Remounting

1) Mount the SUB TAKE-UP BRAKE ASS'Y ③ onto the pin ④. Confirm that the hook ② is firmly hooked to the chassis.
2) Fit the SPRING COIL between hooks ⑤ and ⑥.
3) Mount the COMPL CASSETTE MECHANISM as instructed in 5-2-1.

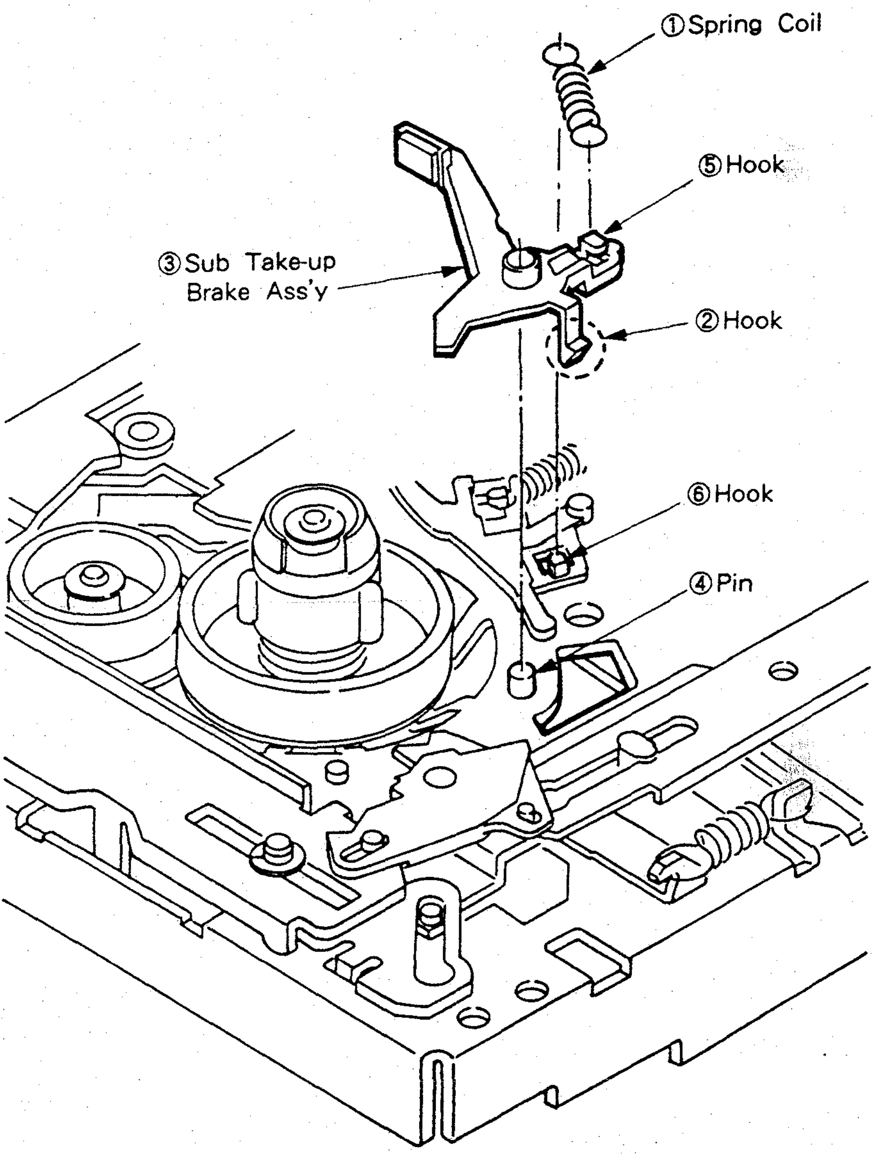

①Spring Coil
⑤Hook
③Sub Take-up Brake Ass'y
②Hook
⑥Hook
④Pin

Fig. 5-7-1. Sub Take-up Brake Ass'y

5-7-2. Supply Brake Ass'y and Take-up Brake Ass'y (See Fig. 5-7-2.)

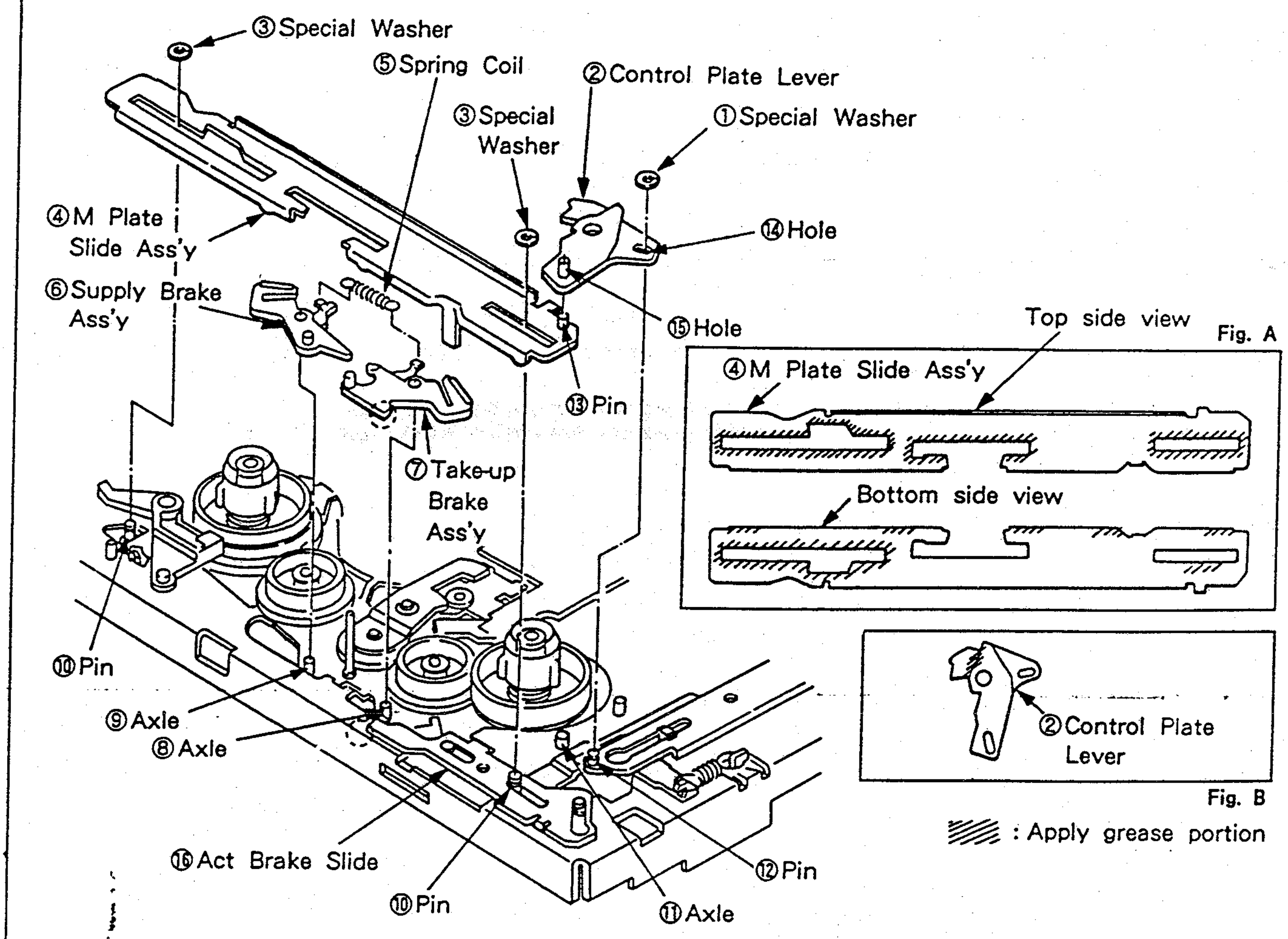
1. Removal

1) Remove the COMPL CASSETTE MECHANISM as instructed in 5-2-1.
2) Remove the SUB TAKE-UP BRAKE as instructed in 5-7-1.
3) Remove the special washer ①, then remove the CONTROL PLATE LEVER ②.
4) Remove the two special washers ③, then remove the M PLATE SLIDE ASS'Y ④.
5) Remove the SPRING COIL ⑤.
6) Remove the SUPPLY BRAKE ASS'Y ⑥ and the TAKE-UP BRAKE ASS'Y ⑦.

Note : Take care not to soil the brake shoes.

2. Remounting

1) Apply a thin layer of grease to axles ⑧ and ⑨.
2) Mount the TAKE-UP BRAKE ASS'Y ⑦ onto the axle ⑧.
3) Mount the SUPPLY BRAKE ASS'Y ⑥ onto the axle ⑨.
4) After applying a thin layer of grease to the M PLATE SLIDE ASS'Y ④ as shown in Fig. A, mount it onto the two pins ⑩.
5) Mount the two special washers ③ onto the two pins ⑩.
6) After applying grease to the CONTROL PLATE LEVER ② as shown in Fig. B, mount it onto the axle ⑪. Insert the ACT PLATE SLIDE ASS'Y pin ⑫ into the hole ⑭, and the M PLATE SLIDE ASS'Y pin ⑬ into the hole ⑮.
7) Mount the special washer ① onto the pin ⑫.
8) Mount the SUB TAKE-UP BRAKE as instructed in 5-7-1.
9) Mount the COMPL CASSETTE MECHANISM as instructed in 5-2-1.


③Special Washer
⑤Spring Coil
②Control Plate Lever
③Special Washer
①Special Washer
④M Plate Slide Ass'y
⑭Hole
⑥Supply Brake Ass'y
⑮Hole
⑬Pin
⑦Take-up Brake Ass'y
Top side view
Fig. A
④M Plate Slide Ass'y
Bottom side view
⑩Pin
⑨Axle
⑧Axle
②Control Plate Lever
Fig. B
▨ : Apply grease portion
⑯Act Brake Slide
⑫Pin
⑩Pin
⑪Axle

When assembling, the contact surfaces of Take-up Break ⑦ and the Break Slide ⑯ marked with ⁝⁝ should contact but not overlap each other.

Fig. 5-7-2. Supply Brake Ass'y & Take-up Brake Ass'y

5-7-3. Tension Lever Ass'y and Band Holder Ass'y (See Fig. 5-7-3.)

1. **Removal**

1) Remove the COMPL CASSETTE MECHANISM as instructed in 5-2-1.
2) Remove the SPRING COIL ①.
3) Remove the screw ③ fixing the BAND HOLDER ASS'Y ②.
4) Push the SUB SUPPLY BRAKE ④ in the direction of the arrow A, setting the BAND HOLDER ASS'Y ② free.
5) Open the hook ⑤ a little and remove the TENSION LEVER ASS'Y ⑥. Take care not to open the hook ⑤ too much, otherwise it may be deformed or broken.
6) Remove the hook ⑦ of the BAND HOLDER ASS'Y.

2. **Remounting**

1) Mount the BAND HOLDER ASS'Y hook ⑦ into the TENSION LEVER ASS'Y hole ⑧.
2) Insert the TENSION LEVER ASS'Y axle ⑨ into the hole ⑩ and confirm that the hook ⑤ is hooked.
3) While pushing the SUB SUPPLY BRAKE ④ in the direction of arrow, mount the BAND HOLDER ASS'Y ② with the screw ③.
4) Hook the SPRING COIL ① between the hooks ⑪ and ⑫.
5) Perform TENSION POLE position adjustment as instructed in 6-3.
6) Mount the COMPL CASSETTE MECHANISM as instructed in 5-2-1.

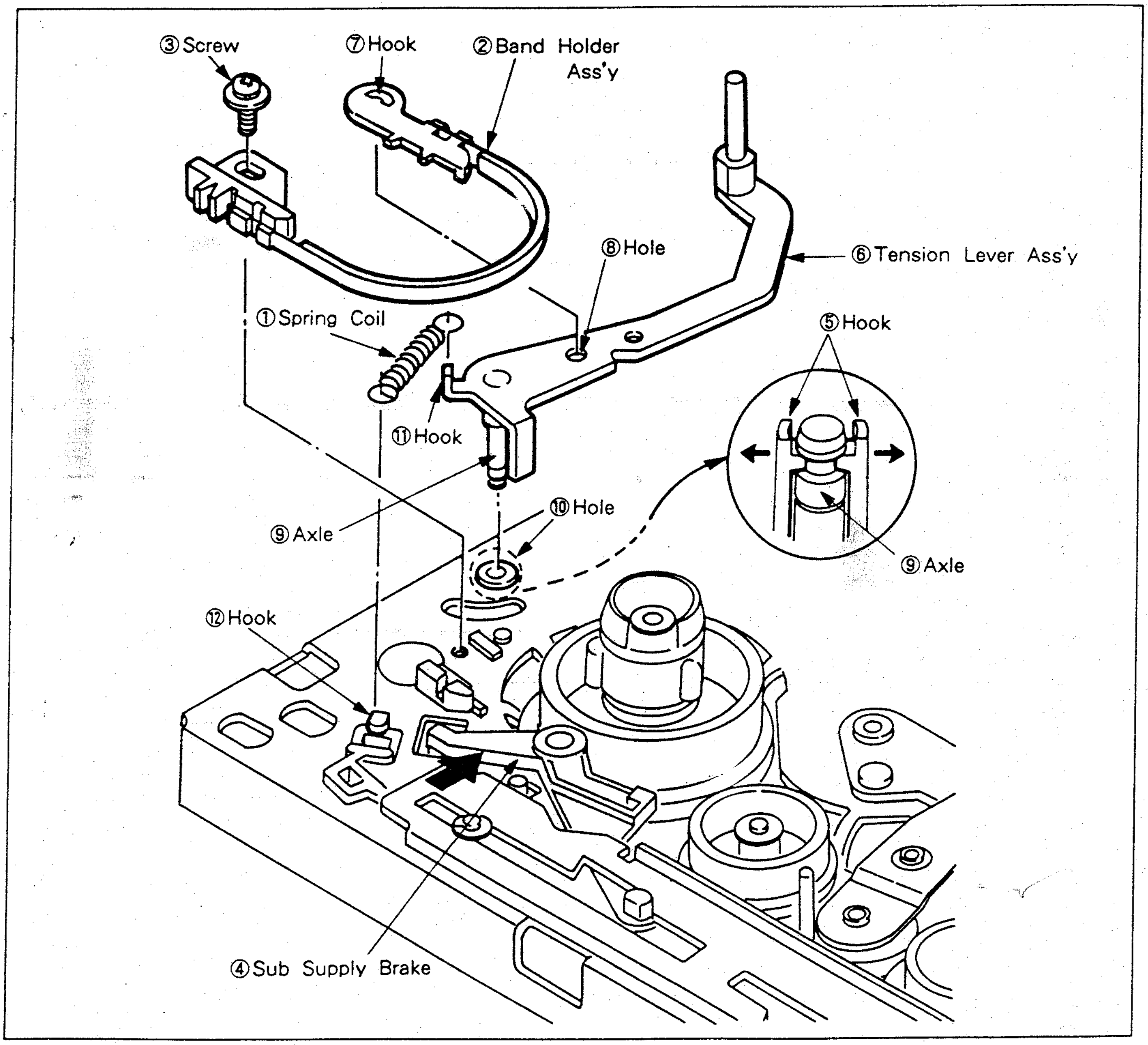

③Screw
⑦Hook
②Band Holder Ass'y
⑧Hole
⑥Tension Lever Ass'y
①Spring Coil
⑤Hook
⑪Hook
⑩Hole
⑨Axle
⑨Axle
⑫Hook
④Sub Supply Brake

Fig. 5-7-3. Tension Lever Ass'y & Band Holder Ass'y

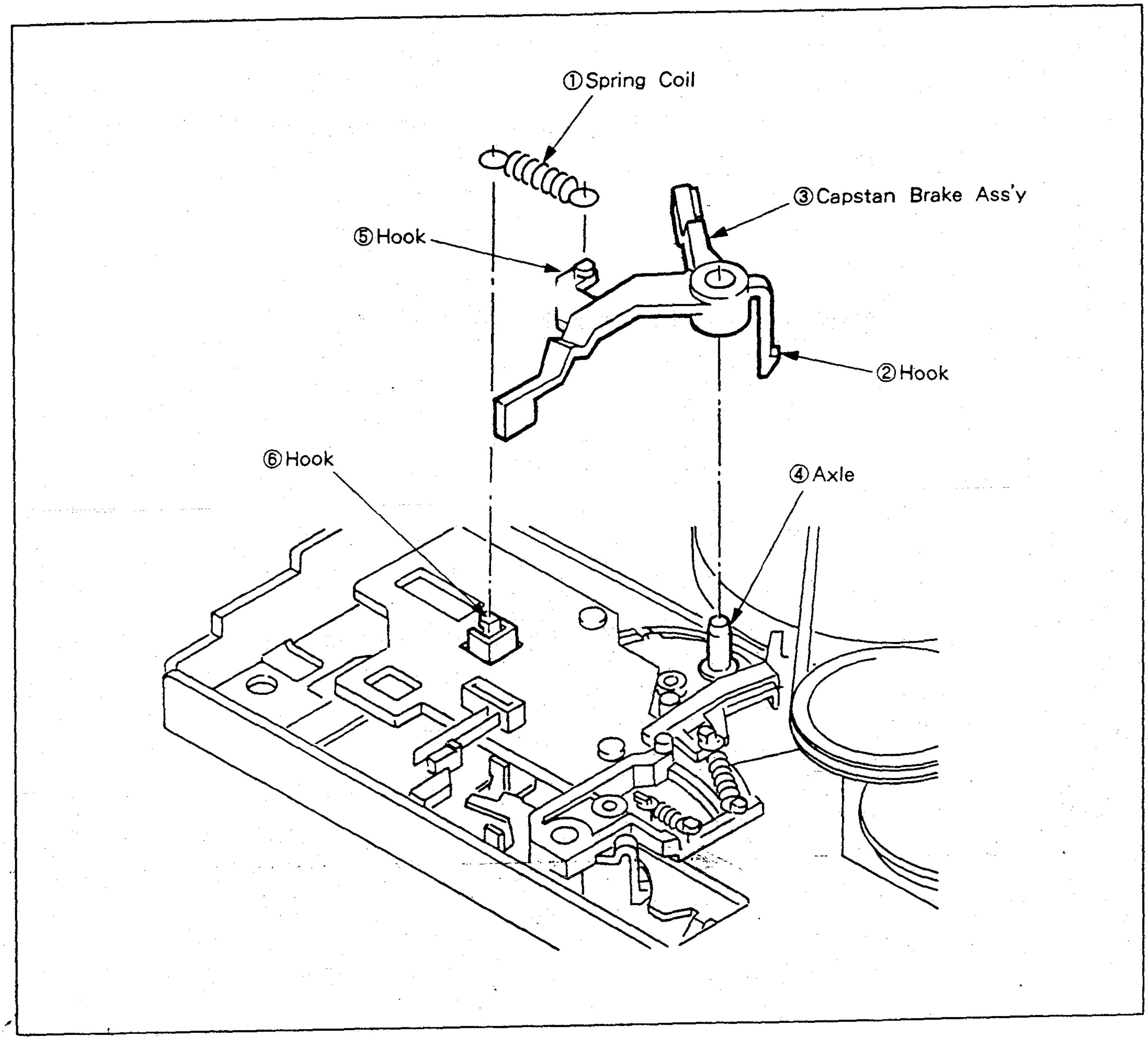
5-7-4. Capstan Brake Ass'y (See Fig. 5-7-4.)

1. Removal

1) Remove the SPRING COIL ①.
2) Unhook the hook ②, then remove the CAPSTAN BRAKE ASS'Y ③.

2. Remounting

1) Mount the CAPSTAN BRAKE ASS'Y ③ onto the axle ④. Confirm that the hook ② is hooked to the chassis.
2) Hook the SPRING COIL ① between hooks ⑤ and ⑥. Fix the hook ⑥ side with adhesive (use an adhesive that allows later detaching).


①Spring Coil
③Capstan Brake Ass'y
⑤Hook
②Hook
⑥Hook
④Axle

5-7-4. Capstan Brake Ass'y

5-8. REEL TABLE DRIVE MECHANISM

5-8-1. Supply Reel Ass'y and Supply Reel Gear (See Fig. 5-8-1.)

1. Removal

1) Remove the COMPL CASSETTE MECHANISM as instructed in 5-2-1.
2) Remove the BAND HOLDER ASS'Y as instructed in 5-7-3.
3) Set the PLAY mode with the mode selector (VHJ-0050).
4) Remove the special washer ①, then remove the SUPPLY REEL ASS'Y ② and the washer ③.
5) Remove the special washer ④.
6) While pushing the SUPPLY BRAKE ASS'Y ⑤ in the direction of arrow A, remove the SUPPLY REEL GEAR ⑥ and the washer ⑦.

Note : Be sure that no dirt gets on the section where both brake shoes make contact.

2. Remounting

1) Apply a little oil (less than one drop) to the part of the axle ⑧ indicated by the arrow B, then mount the washer ⑦.
2) While pushing the SUPPLY BRAKE ASS'Y ⑤ in the direction of arrow A, mount the SUPPLY REEL GEAR ⑥ onto the axle ⑧.
3) Mount the special washer ④ to the axle ⑧.
4) Apply 1 drop of oil to the part of the axle ⑨ indicated by the arrow C, then mount the washer ③.
5) Mount the SUPPLY REEL ASS'Y ② onto the axle ⑨.
6) Perform reel table height adjustment as instructed in 6-2-1.
7) Mount the special washer ① onto the axle ⑨.
8) Mount the BAND HOLDER ASS'Y as instructed in 5-7-3.
9) Perform tension pole position adjustment as instructed in 6-3.
10) Mount the COMPL CASSETTE MECHANISM as instructed in 5-2-1.

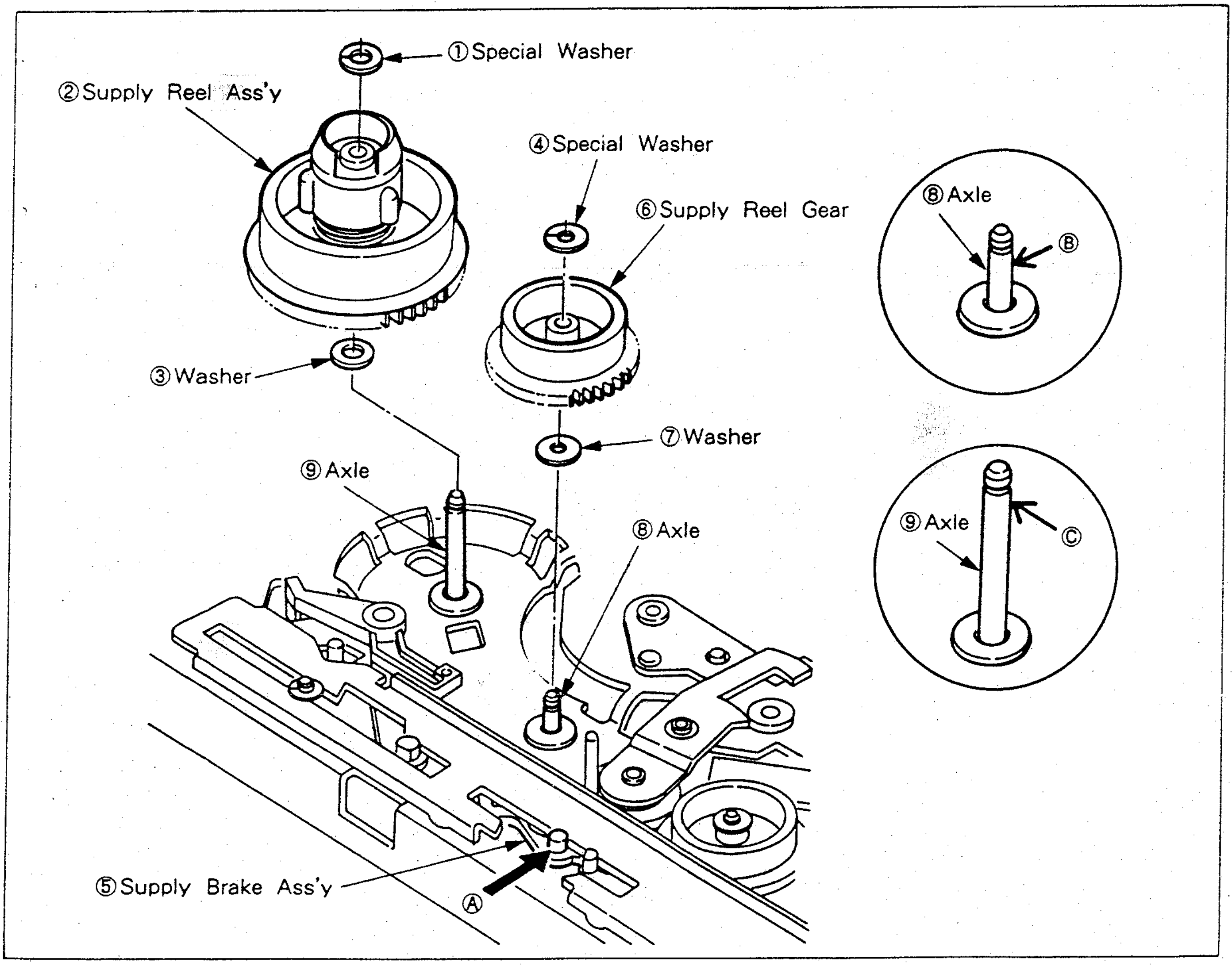


Fig. 5-8-1. Supply Reel Ass'y & Supply Reel Gear

5-8-2. Take-up Reel Ass'y (See Fig. 5-8-2.)

1. Removal

1) Remove the COMPL CASSETTE MECHANISM as instructed in 5-2-1.
2) Remove the special washer ①.
3) Push the SUB TAKE-UP BRAKE ASS'Y ② in the direction of arrow A to release the brake, then remove the TAKE-UP REEL ASS'Y ③ and the washer ④.

Note : Be sure that no dirt gets on the section where both brake shoes make contact.

2. Remounting

1) Apply 1 drop of oil to the part of the axle ⑤ indicated by the arrow B, then mount the washer ④.
2) While pushing the SUB TAKE-UP BRAKE ASS'Y ② in the direction of arrow A, mount the TAKE-UP REEL ASS'Y ③ onto the axle ⑤.
3) Perform reel table height adjustment as instructed in 6-2.
4) Mount the special washer ① onto the axle ⑤.
5) Mount the COMPL CASSETTE MECHANISM as instructed in 5-2-1.

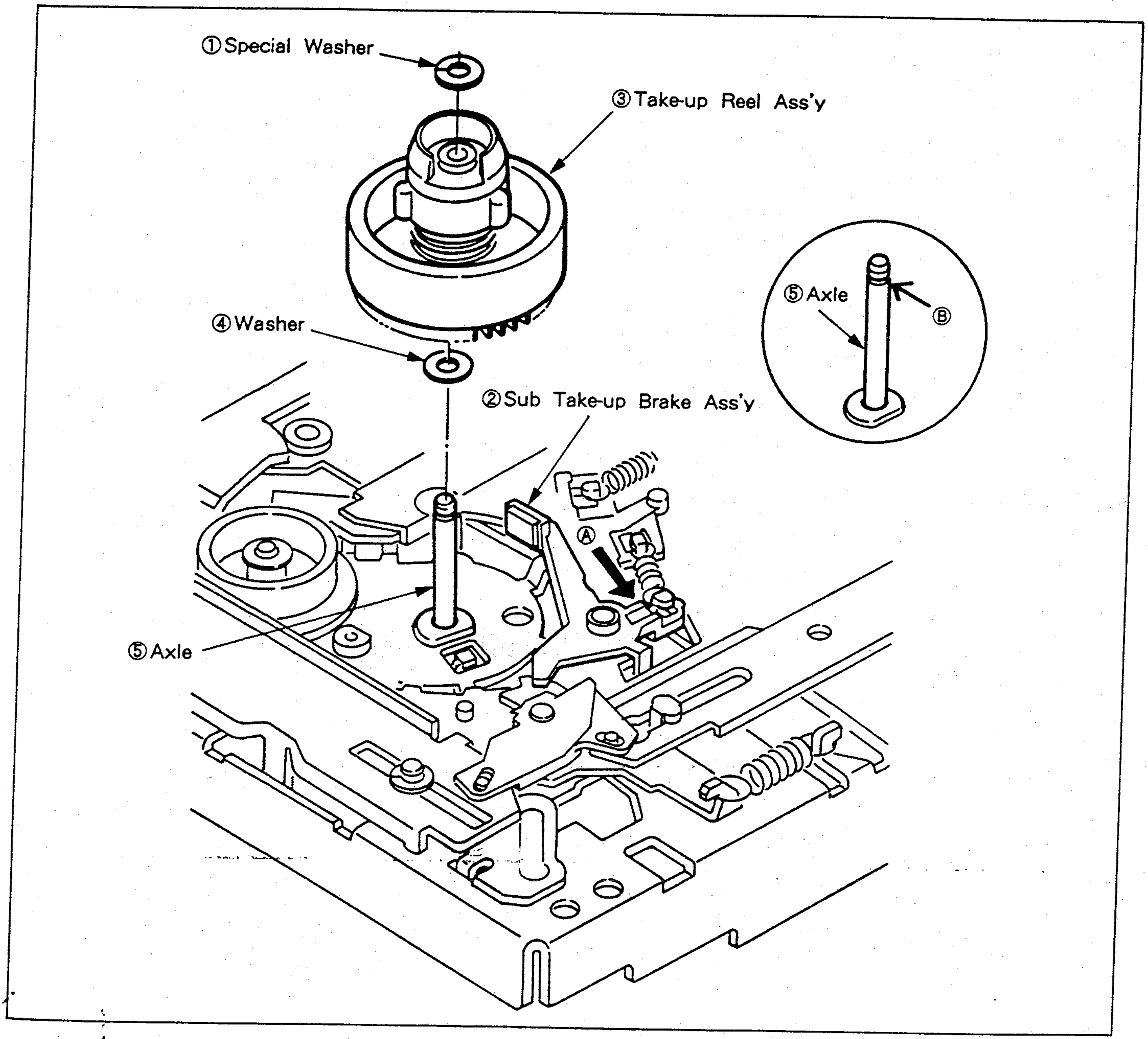


Fig. 5-8-2. Take-up Reel Ass'y

5-8-3. Take-up Reel Gear (See Fig. 5-8-3.)

1. **Removal**

1) Remove the COMPL CASSETTE MECHANISM as instructed in 5-2-1.
2) Remove the TAKE-UP REEL ASS'Y as instructed in 5-8-2.
3) Remove the SUB TAKE-UP BRAKE ASS'Y as instructed in 5-7-1.
4) Remove the TAKE-UP BRAKE ASS'Y as instructed in 5-7-2.
5) Remove the special washer ①, then remove the TAKE-UP REEL GEAR ③ and the washer ④.

2. **Remounting**

1) Apply a little oil (less than one drop) to the part of the axle ⑤ indicated with an arrow.
2) Mount the washer ④ and the TAKE-UP REEL GEAR ③ onto the axle ⑤.
3) Mount the special washer ① onto the axle ⑤.
4) Mount the TAKE-UP BRAKE ASS'Y as instructed in 5-7-2.
5) Mount the SUB TAKE-UP BRAKE ASS'Y as instructed in 5-7-1.
6) Mount the TAKE-UP REEL ASS'Y as instructed in 5-8-2.
7) Mount the COMPL CASSETTE MECHANISM as instructed in 5-2-1.

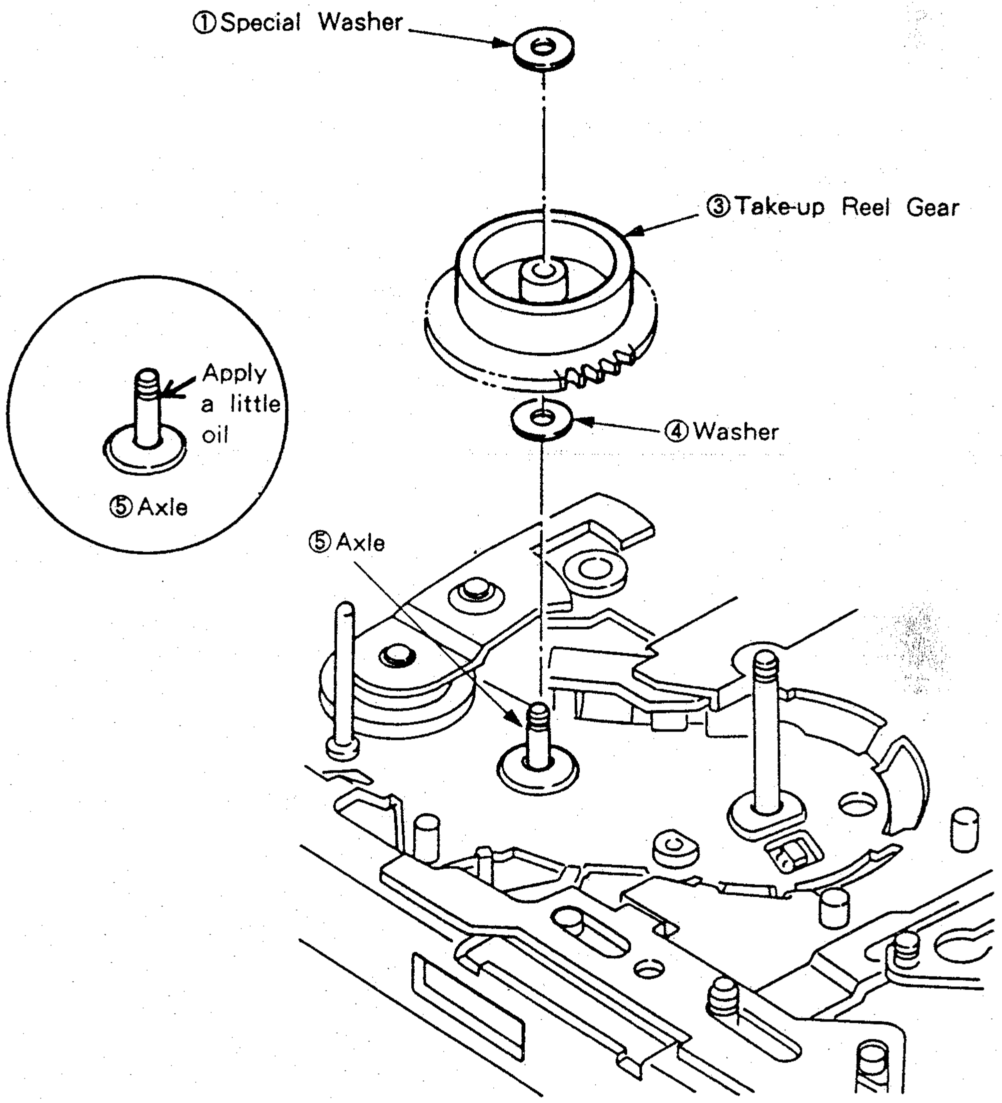


Fig. 5-8-3. Take-up Reel Gear

5-8-4. Reel Pulley and Friction Gear Ass'y (See Fig. 5-8-4.)

1. Removal

1) Remove the two screws ①, then remove the PULLEY BRACKET ②.
2) Remove the REEL DRIVE BELT ③.
3) Remove the special washer ④, then remove the REEL PULLEY ⑤. .
4) Remove the special washer ⑥, then remove the FRICTION GEAR ASS'Y ⑦ and the washer ⑧.

2. Remounting

1) Apply one drop of oil to the parts of axles ⑨ and ⑩ indicated with an arrow.
2) Mount the washer ⑧ and the FRICTION GEAR ASS'Y ⑦ onto the axle ⑨.
3) Mount the special washer ⑥ onto the axle ⑨.
4) Mount the REEL PULLEY ⑤ onto the axle ⑩.
5) Mount the special washer ④ onto the axle ⑩.
6) Set the REEL DRIVE BELT ③.
7) Mount the PULLEY BRACKET ② with the two screws ①.

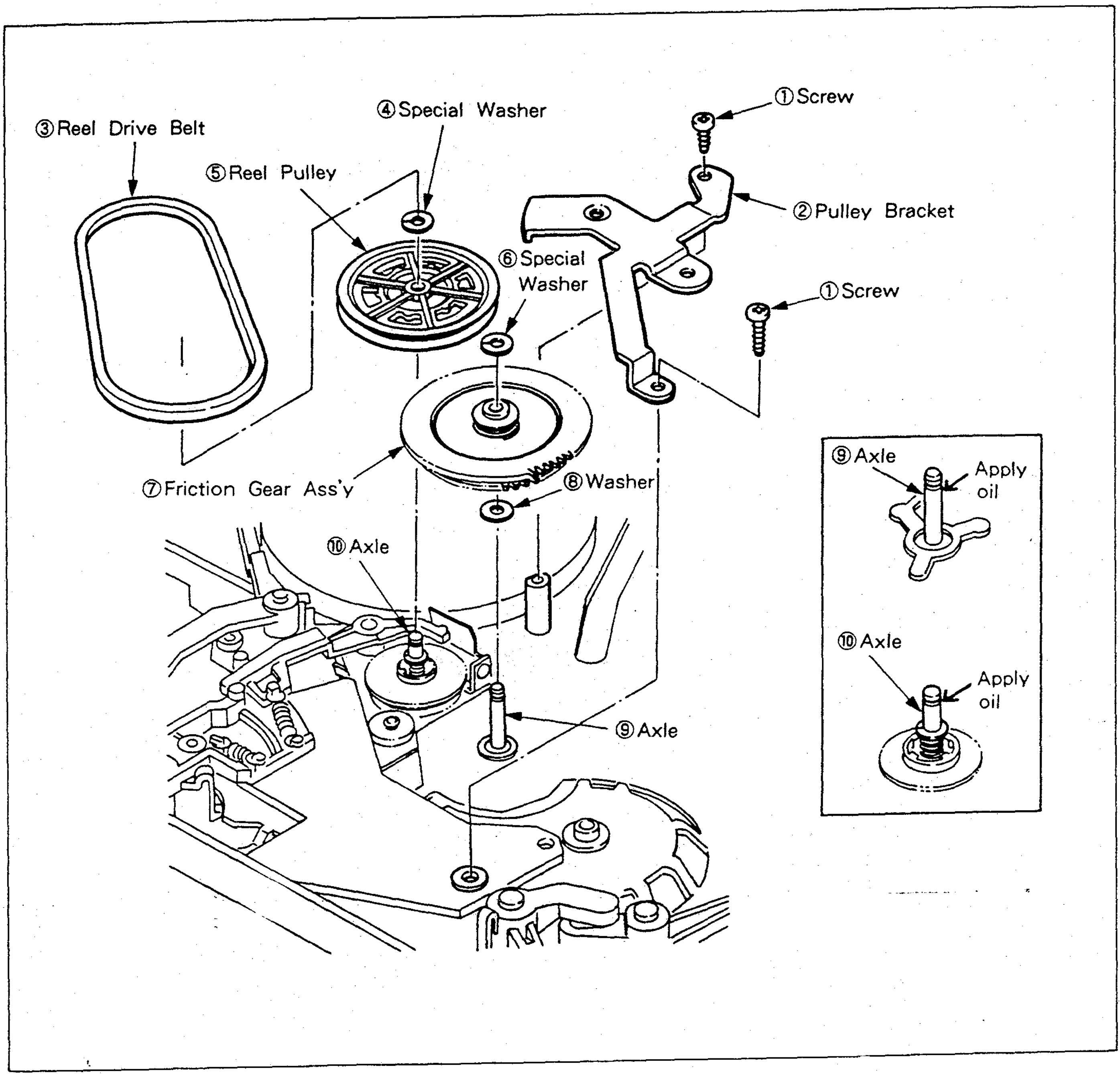

③Reel Drive Belt
④Special Washer
⑤Reel Pulley
①Screw
②Pulley Bracket
⑥Special Washer
①Screw
⑦Friction Gear Ass'y
⑧Washer
⑩Axle
⑨Axle
⑨Axle
Apply oil
⑩Axle
Apply oil

Fig. 5-8-4. Reel Pulley & Friction Gear

5-8-5. COMPL Clutch (See Fig. 5-8-5.)

1. Removal

1) Remove the COMPL CASSETTE MECHANISM as instructed in 5-2-1.
2) Remove the PULLEY BRACKET, the REEL DRIVE BELT and the REEL PULLEY as instructed in 5-8-4.
3) Remove the screw ①, then remove the COMPL MC-4 ②.
4) Remove the two screws ③, then remove the COMPL CLUTCH ④.

2. Remounting

1) Mount the COMPL CLUTCH ④ with the two screws ③, aligning it with the protuberance ⑤.
2) After inserting the CN831 (COMPL MC-4) into the CN801 (COMPL MC-1), mount the COMPL MC-4 with the screw ①.
3) Mount the REEL PULLEY, the REEL DRIVE BELT and the PULLEY BRACKET as instructed in 5-8-4.
4) Mount the COMPL CASSETTE MECHANISM as instructed in 5-2-1.

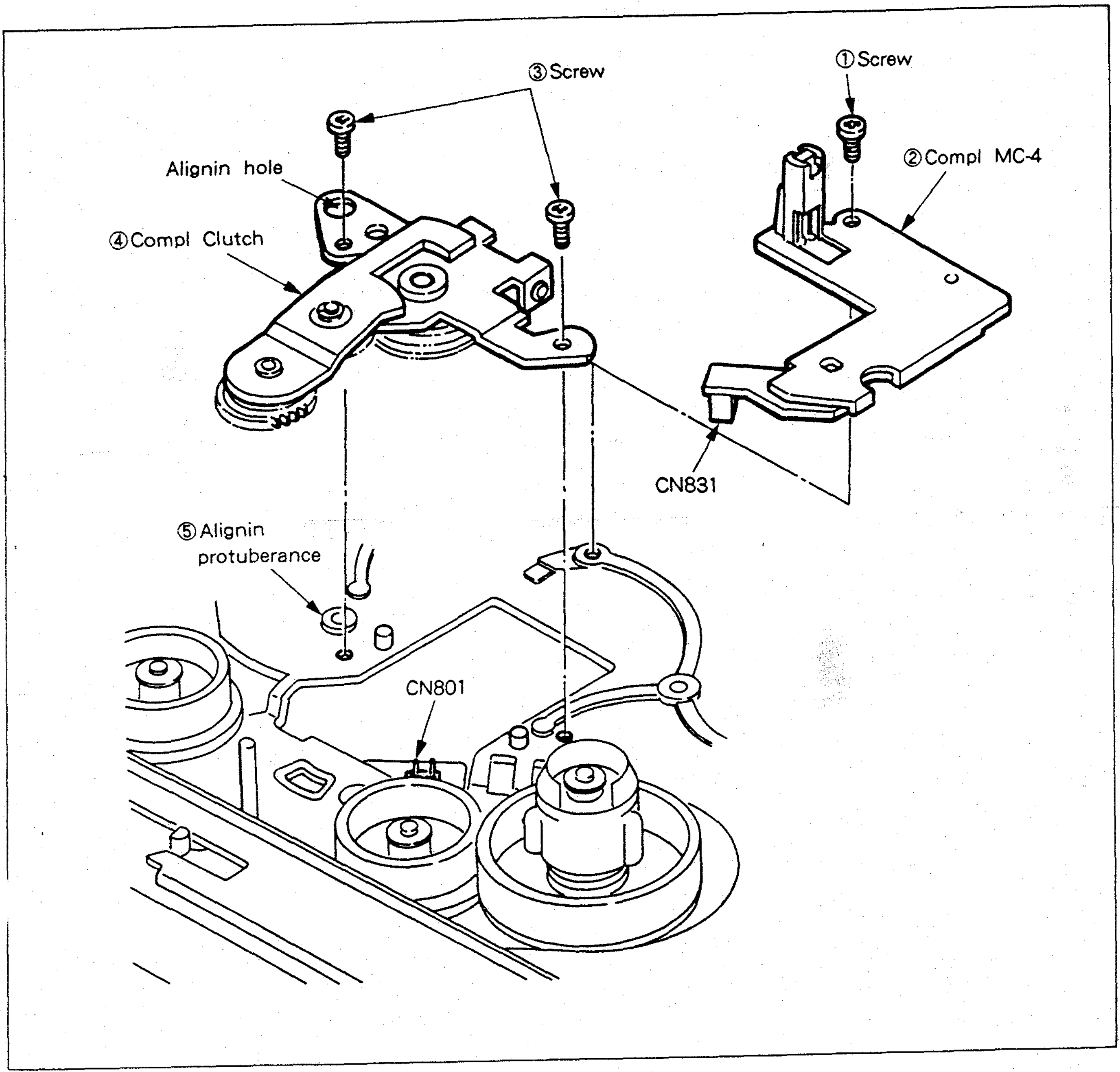

③Screw
①Screw
Alignin hole
②Compl MC-4
④Compl Clutch
CN831
⑤Alignin protuberance
CN801

Fig. 5-8-5. Compl Clutch

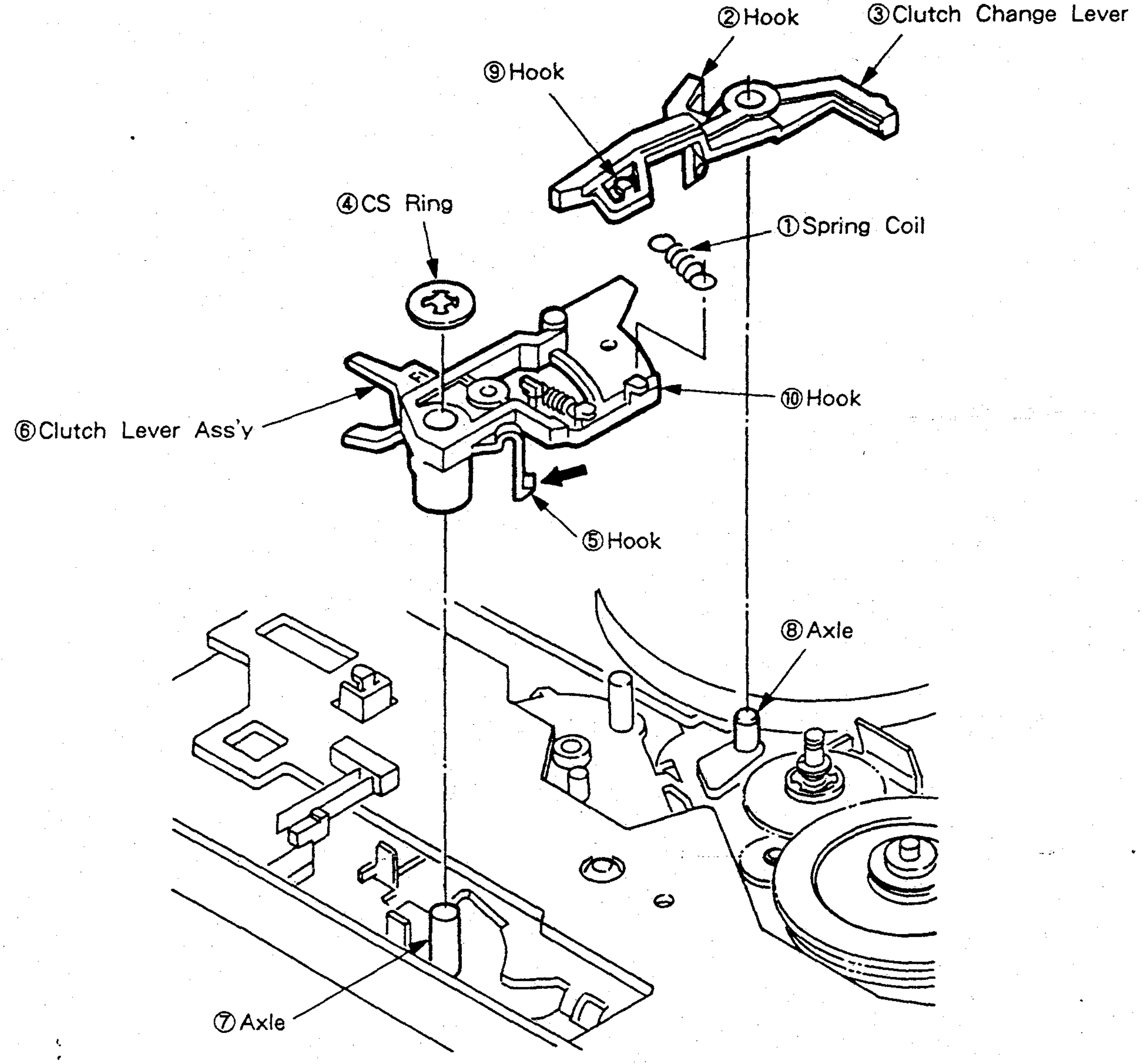
5-8-6. Clutch Change Lever and Clutch Lever Ass'y (See Fig. 5-8-6.)

1. Removal

1) Remove the CAPSTAN BRAKE ASS'Y as instructed in 5-7-4.
2) Remove the PULLEY BRACKET, the REEL DRIVE BELT and the REEL PULLEY as instructed in 5-8-4.
3) Remove the SPRING COIL ①.
4) Unhook the hook ②, then remove the CLUTCH CHANGE LEVER ③.
5) Remove the CS ring ④.
6) Unhook the hook ⑤, then remove the CLUTCH LEVER ASS'Y ⑥.

2. Remounting

1) Mount the CLUTCH LEVER ASS'Y ⑥ onto the axle ⑦. Confirm that the hook ⑤ is hooked to the chassis.
2) Mount the CS ring ④ onto the axle ⑦.
3) Mount the CLUTCH CHANGE LEVER ③ onto the axle ⑧. Confirm that the hook ② is hooked to the chassis.
4) Hook the SPRING COIL ① between the hooks ⑨ and ⑩.
5) Mount the PULLEY BRACKET, the REEL DRIVE BELT and the REEL PULLEY as instructed in 5-8-4.
6) Mount the CAPSTAN BRAKE ASS'Y as instructed in 5-7-4.



②Hook
③Clutch Change Lever
⑨Hook
④CS Ring
①Spring Coil
⑩Hook
⑥Clutch Lever Ass'y
⑤Hook
⑧Axle
⑦Axle

Fig. 5-8-6. Clutch Change Lever & Clutch Lever Ass'y

5-9. CAPSTAN MOTOR (See Fig. 5-9-1.)

1. Removal

1) Remove the CAPSTAN BRAKE ASS'Y as instructed in 5-7-4.
2) Remove the CAPSTAN MOTOR ⑥ connector.
3) Remove the REEL DRIVE BELT ② from the CAPSTAN MOTOR PULLEY ①.
4) Remove the two screws ④ fixing the COMPL CASSETTE MECHANISM TOP BOARD ③, then slide the TOP BOARD ③ backward.
5) Remove the three screws ⑤, then remove the CAPSTAN MOTOR ⑥.

Note : Take care not to scratch or soil the capstan axle.

2. Remounting

1) Mount the CAPSTAN MOTOR ⑥ with the three screws ⑤.
2) Connect the CAPSTAN MOTOR ⑥ connector.
3) Mount the TOP BOARD ③ with the two screws ④.
4) Fit the REEL DRIVE BELT ② around the CAPSTAN MOTOR PULLEY ① and the REEL PULLEY ⑦.
5) Mount the CAPSTAN BRAKE ASS'Y as instructed in 5-7-4.

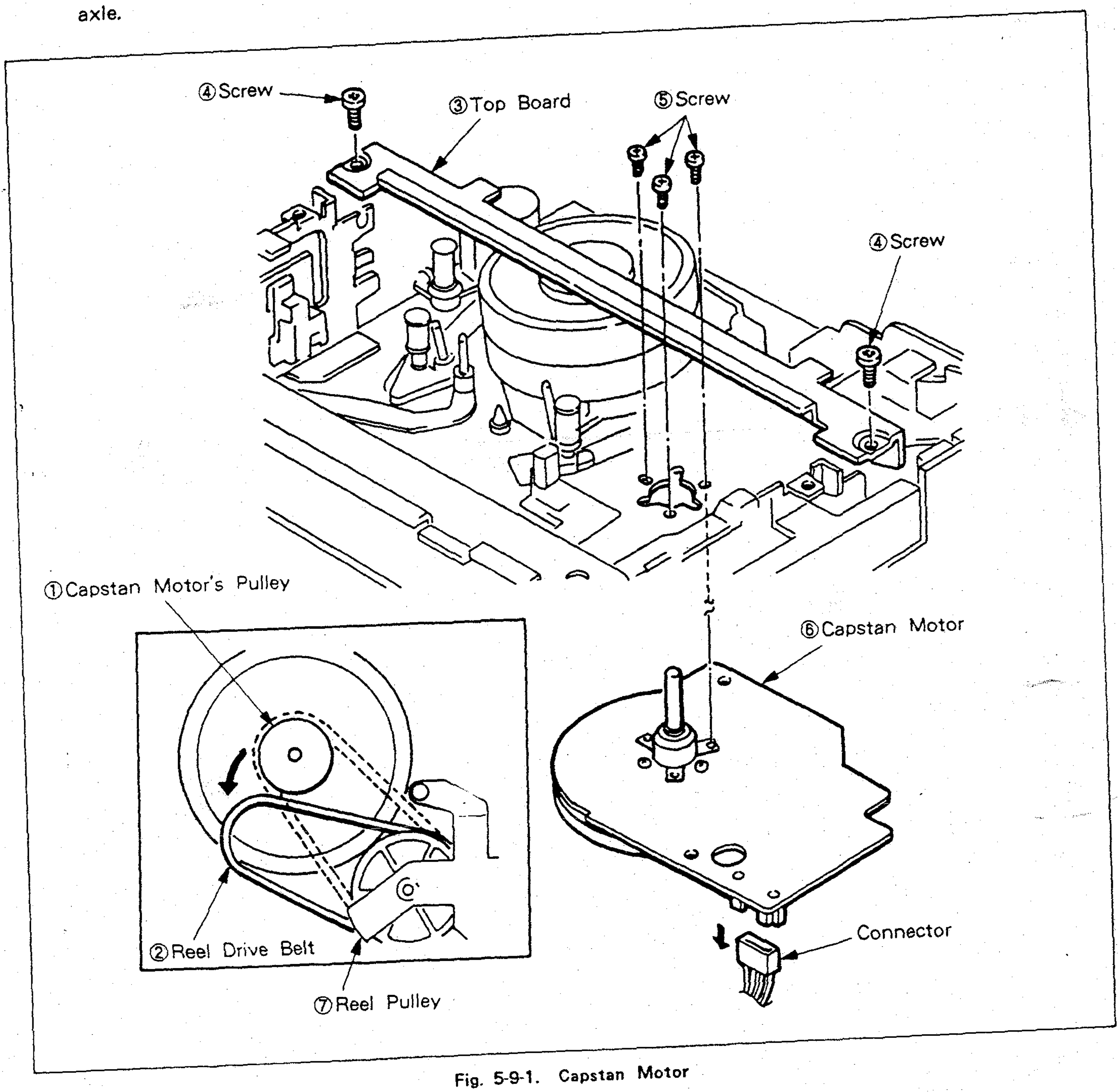

④Screw
③Top Board
⑤Screw
④Screw
①Capstan Motor's Pulley
⑥Capstan Motor
②Reel Drive Belt
⑦Reel Pulley
Connector

Fig. 5-9-1. Capstan Motor

5-10. FIXED GUIDE, FE HEAD LEVER ASS'Y

5-10-1. S-Side Fixed Guide and FE Lever Ass'y (See Fig. 5-10-1.)

1. Removal

1) Remove the SP NUT ①, then remove the SP washer ② (upper), the GUIDE PIPE ③, the SP washer ② (lower) ,and the SPRING COIL ④, in that order.
2) Remove the SPRING COIL ⑤.
3) Remove the FTE HEAD connector.
4) Remove the special washer ⑥, then remove the FE HEAD LEVER ASS'Y ⑦.

2. Remounting

1) After mounting the FE LEVER ASS'Y ⑦ onto the axle ⑧, mount the special washer ⑥.
2) Hook the SPRING COIL ⑤ between the chassis notch ⑨ and the FE LEVER ASS'Y hook ⑩.
3) Connect the SPRING COIL ④, the SP washer ② (lower), the GUIDE pipe ③, the SP washer ② (upper) and the SP NUT ① to the axle ⑧, in that order.
4) Connect the connector to the FTE HEAD.
5) Perform height adjustment of the fixed guide (S) as instructed in 6-4.

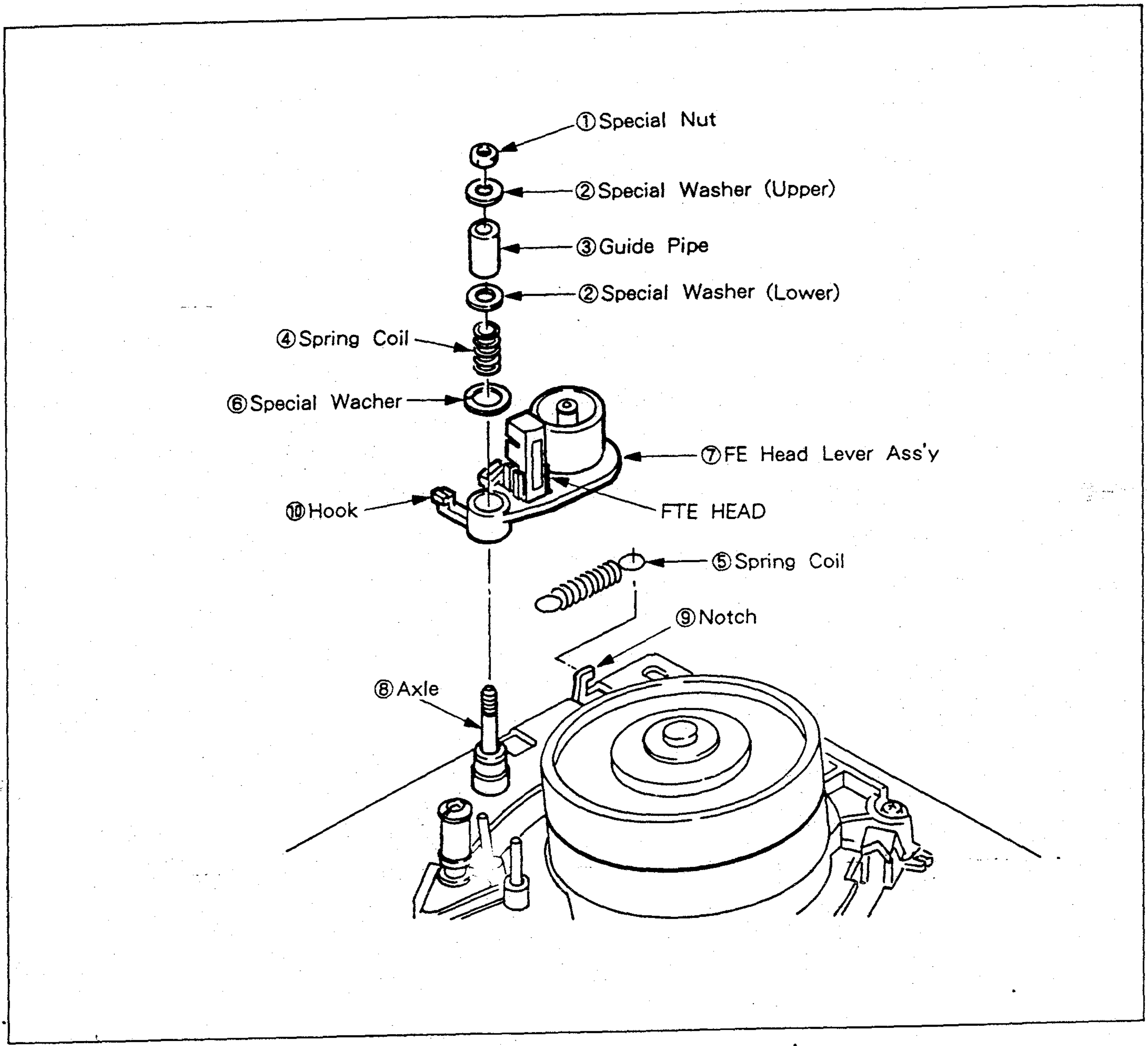

①Special Nut
②Special Washer (Upper)
③Guide Pipe
②Special Washer (Lower)
④Spring Coil
⑥Special Wacher
⑦FE Head Lever Ass'y
⑩Hook
FTE HEAD
⑤Spring Coil
⑨Notch
⑧Axle

Fig. 5-10-1. Fixed Guide (S) & FE Lever Ass'y

5-10-2. Impedance Roller, FTE Head (See Fig. 5-10-2.)

1. Removal

1) Remove the FTE HEAD (full track erase head) ① connector.
2) Remove the special washer ②, then remove the IMPEDANCE ROLLER ③ and the washer ④.
3) Open the hook ⑤ a little and remove the FTE HEAD ①.

Note : Take care not to open the hook too much, otherwise it may be deformed or broken.

2. Remounting

1) Mount the FTE HEAD ① onto the FE HEAD LEVER ASS'Y ⑥. Confirm that the hook ⑤ is hooked to the FTE HEAD ①.
2) Mount the washer ④ and the IMPEDANCE ROLLER ③, in that order, onto the axle ⑦, then mount the special washer ②.
3) Connect the connector to the terminal of the FTE HEAD ①.

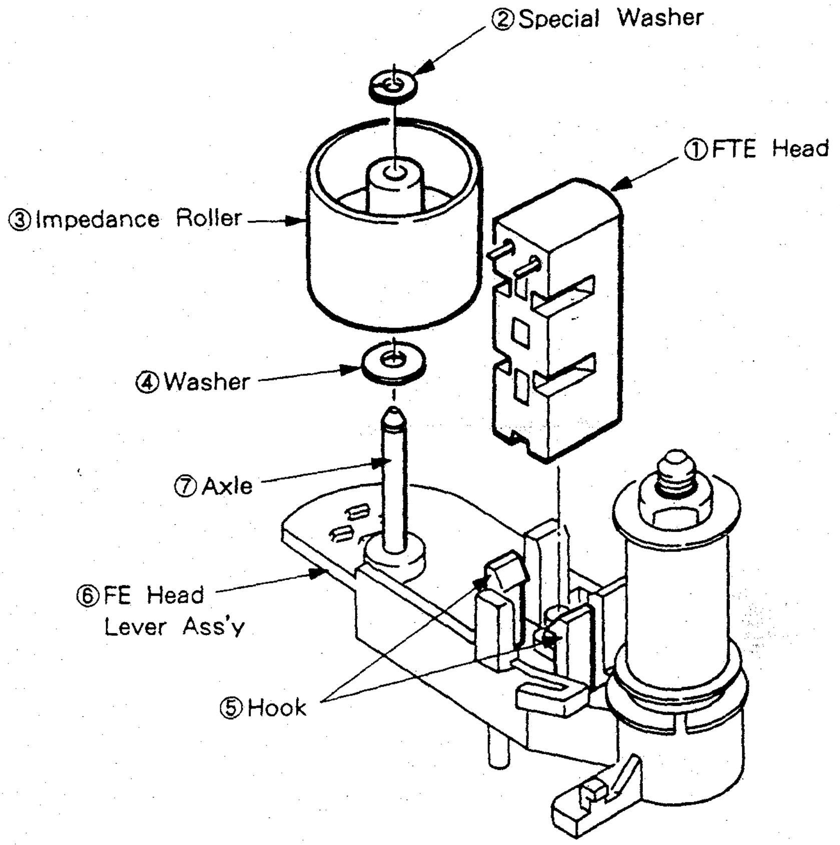

②Special Washer
①FTE Head
③Impedance Roller
④Washer
⑦Axle
⑥FE Head Lever Ass'y
⑤Hook

Fig. 5-10-2. Impedance Roller & FTE Head

5-10-3. Fixed (T) Guide (See Fig. 5-10-3.)

1. Removal

1) Remove the CAP ①.
2) Remove the SP NUT ②, then remove the SP washer ③ (upper), the GUIDE PIPE ④, the SP washer ③ (lower) and the SPRING COIL ⑤, in that order.

Note : Shape of the CAP differ from drawing in the figure depending on the model.

2. Remounting

1) Mount the SPRING COIL ⑤, the SP washer ③ (lower), the GUIDE PIPE ④, the SP washer ③ (upper) and the SP NUT ②, in that order, to the axle ⑥.
2) Mount the CAP ① onto the axle ⑥.
3) Perform height adjustment of the fixed guide (T) as instructed in 6-4.

Note : In some models, the CAP ① is attached to the SPRING GUIDE ⑦. In this case, place the SPRING GUIDE ⑦ into the guide hole ⑧ of the GUIDE BRACKET screwed to the COMPL CASSETTE MECHANISM as shown in Fig. A.

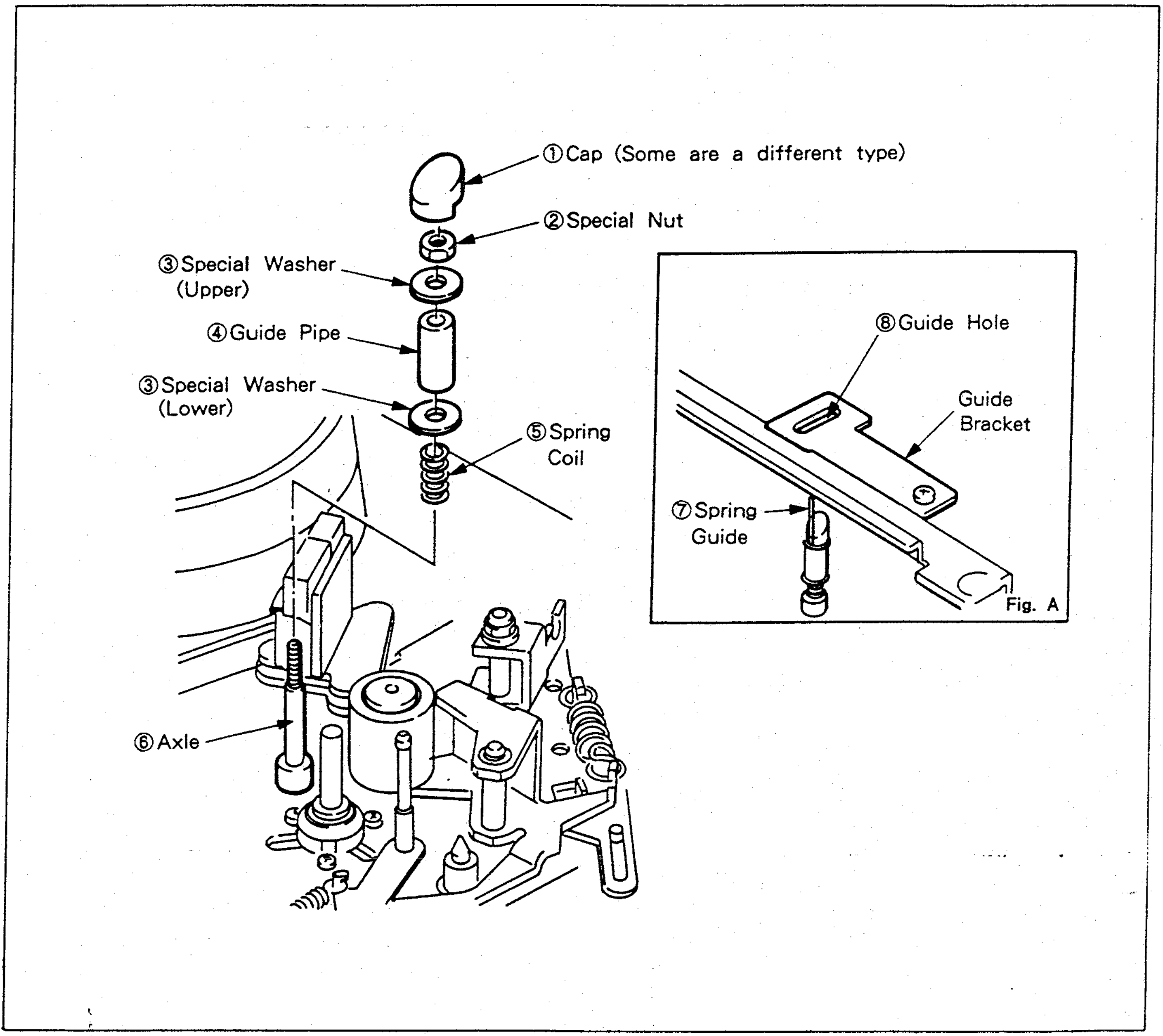

①Cap (Some are a different type)
②Special Nut
③Special Washer (Upper)
④Guide Pipe
③Special Washer (Lower)
⑤Spring Coil
⑥Axle
⑧Guide Hole
Guide Bracket
⑦Spring Guide
Fig. A

Fig. 5-10-3. Fixed Guide (T)

5-11. DRUM SECTION

5-11-1. Drum Motor (rotor, stator) (See Fig. 5-11-1.)

1. Removal

1) Remove the screw ①, then remove the CYLINDER EARTH ASS'Y ②.
2) Remove the two screws ③, then remove the ROTOR ④.
3) Remove the STATOR board connector.
4) Remove the three screws ⑤, then remove the STATOR ⑥.

2. Remounting

1) Mount the STATOR ⑥ with the three screws ⑤.
2) While aligning the ROTOR oval hole ⑦ with the ROTOR DISK hole ⑧, mount the ROTOR with the two screws ③.
3) Insert the connector ⑩.
4) While aligning the CYLINDER EARTH ASS'Y ② protuberance with the chassis hole ⑨, mount it with the screw ①.

Note 1 : Use a torque driver (VHJ-0014) for mounting the STATOR ⑥ and the ROTOR ④. Set fastening torque to 3kg-cm.

Note 2 : When the drum unit has been replaced, perform a tape path adjustment as instructed in 6-4. and perform a CH-1/CH-2 switching position adjustment of the servo circuit.

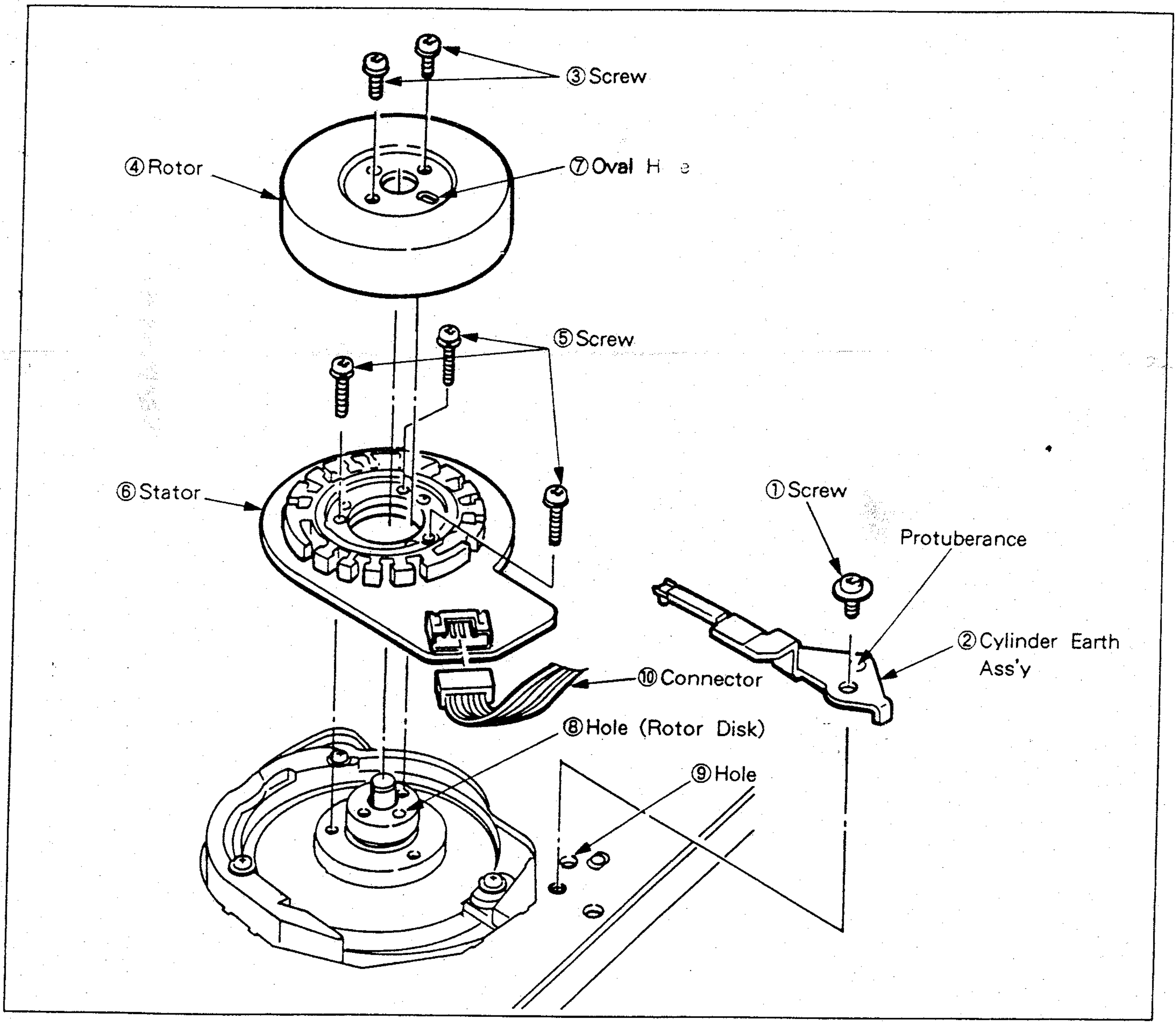

③Screw
④Rotor
⑦Oval Hole
⑤Screw
⑥Stator
①Screw
Protuberance
②Cylinder Earth Ass'y
⑩Connector
⑧Hole (Rotor Disk)
⑨Hole

Fig. 5-11-1. Drum Motor

5-11-2. Drum Unit (See Fig. 5-11-2.)

1. Removal

1) For some models with the board located above the upper drum, remove the board.
2) Remove the flexible P.C.B. ① from the COMPL VP-1 (take care not to pull the flexible P.C.B. in the upward direction).
3) Remove the LOAD· RACK only, as instructed in 5-4-1.
4) Remove the three screws ②, then remove the drum unit ③.

Note 1 : A spacer ⑥ is sometimes inserted between the LOWER DRUM (LOWER CYLINDER) ④ and the DRUM BASE (CYLINDER BASE) ⑤. In this case, put it back in its original position when remounting the drum.

Note 2 : When removing and remounting the drum unit, handle it carefully to protect it from scratches and dirt.

2. Remounting

1) While aligning the drum unit ③ to the protuberance, mount it to the drum base (CYLINDER BASE) ⑤ with the three screws ②.
2) Mount the ROAD RACK as instructed in 5-4-1.
3) Insert the flexible P.C.B. into the COMPL VP-1.
4) Clean the drum unit.
5) Perform the tape path adjustment as instructed in 6-4. and perform the CH-1/CH-2 switching position adjustment of the servo circuit.

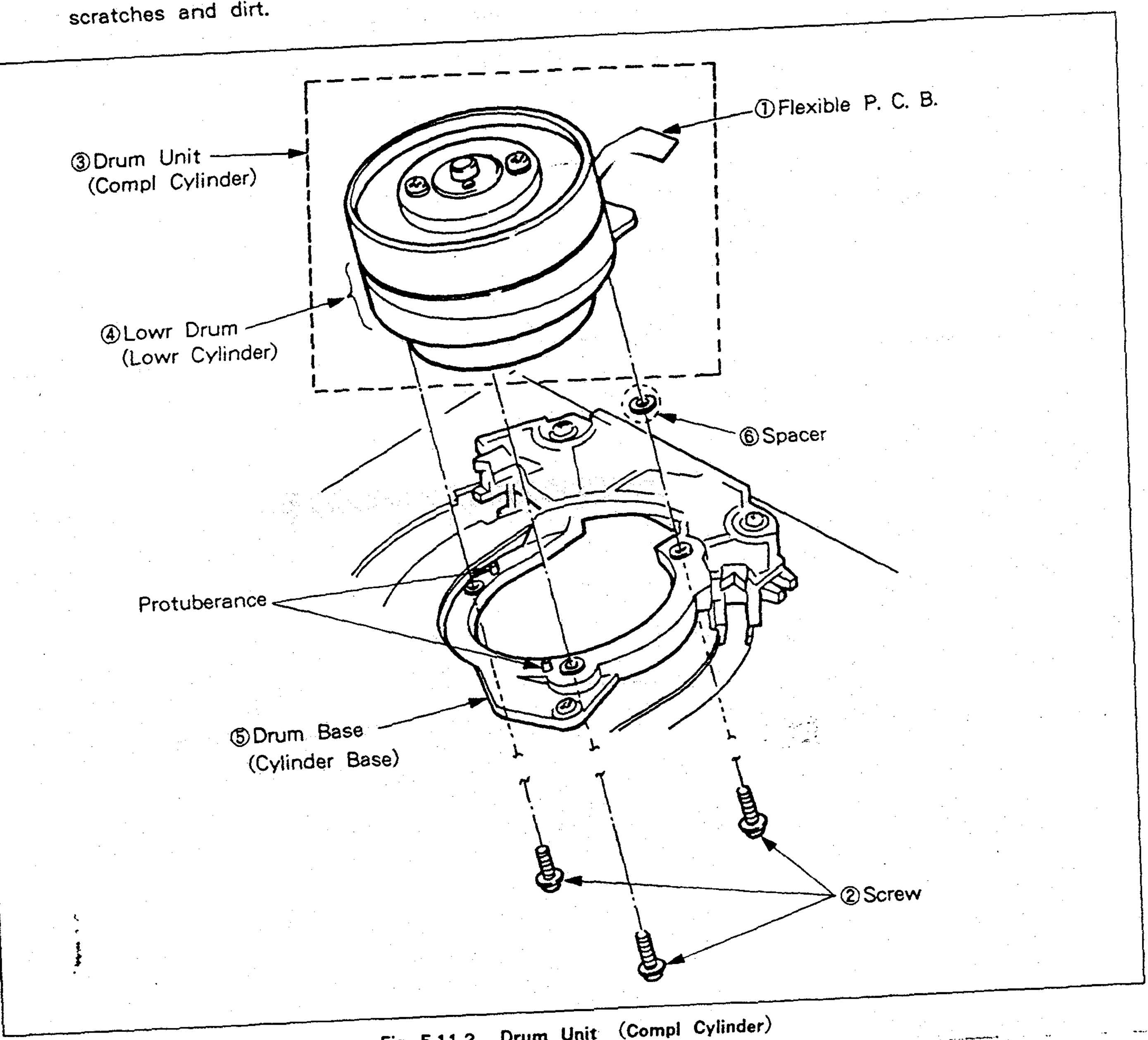

①Flexible P. C. B.
③Drum Unit
(Compl Cylinder)
④Lowr Drum
(Lowr Cylinder)
⑥Spacer
Protuberance
⑤Drum Base
(Cylinder Base)
②Screw

Fig. 5-11-2 Drum Unit (Compl Cylinder)

5-11-3. Upper Drum (Upper Cylinder)

1. Removal

1) Remove the two screws ① (see Fig. 5-11-3).
2) In case the RE (ROTARY ERASE) HEAD is attached to the upper drum (UPPER CYLINDER), remove the lead wires soldered from the P.C. board (see Fig. 5-11-4.).
3) Turn the head removing jig (VHJ-0041) handle ② counterclockwise to lift up the stopper ③ (see Fig. 5-11-5.).
4) Insert the two long screws ④ of the jig into the screw holes ⑥ located on the head chip side of the upper drum (UPPER CYLINDER) ⑤, then mount by turning the handle clockwise.
5) While holding the jig so that the upper drum ⑤ does not rotate, turn the handle ② clockwise to remove the upper drum.
6) Remove the jig from the upper drum.

Note : Handle parts carefully to protect the drum from scratches and dirt, and the video head from damage.

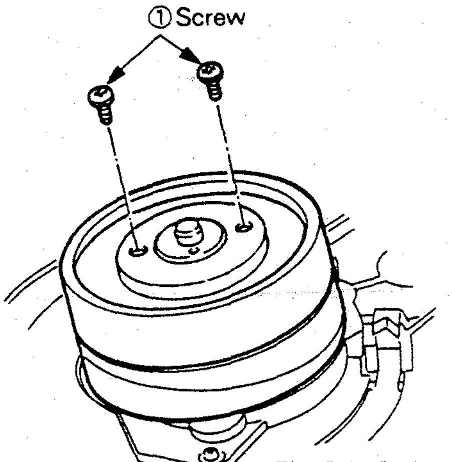


Fig. 5-11-3

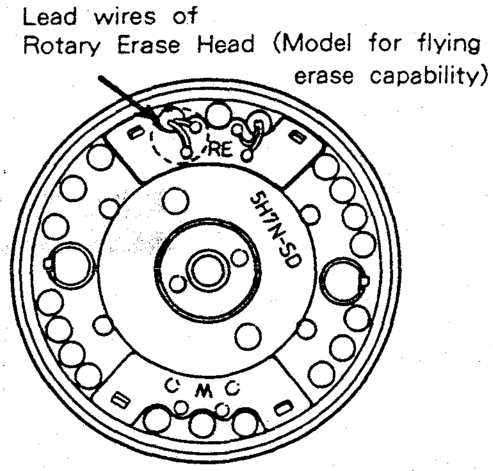

Lead wires of
Rotary Erase Head (Model for flying erase capability)
RE
SH7N-SD
C M C

Fig. 5-11-4

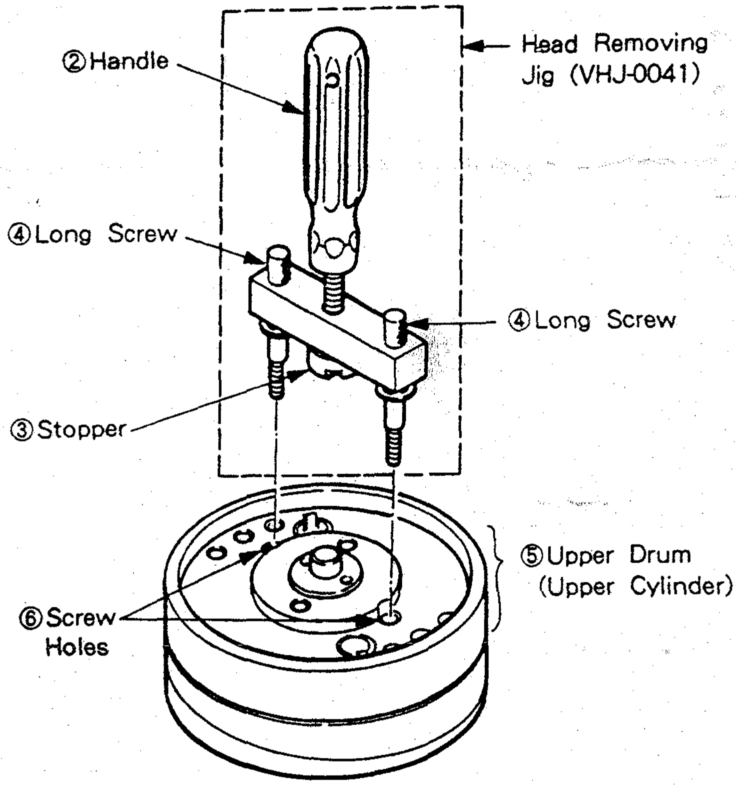

②Handle
Head Removing Jig (VHJ-0041)
④Long Screw
④Long Screw
③Stopper
⑤Upper Drum (Upper Cylinder)
⑥Screw Holes

Fig. 5-11-5

Upper Drum (Upper Cylinder)

2. Remounting (See Fig. 5-11-6.)

1) Confirm that surfaces where the flywheel and the upper drum (UPPER CYLINDER) are engaged or make contact portion are free from scratches and dirt.
2) The code name ① of the drum is printed on the video head side of the upper drum ⑤ SP CH-1 (channel A, plus azimuth). The code name ① is set with in the rotary transformer terminal round hole side ② position of lower drum (LOWER CYLINDER), so that the two screw holes ③ of the upper drum are aligned with the two screw holes ④ of the flywheel. (Refer to 3. Recognizing the SP CH-1 Head side).
3) In case the RE (ROTARY ERASE) HEAD is attached to the upper drum, pass the lead wires through the lead wire hole. (See Fig.5-11-4.)
4) While keeping the upper drum ⑤ parallel to the lower drum (LOWER CYLINDER) ⑧, insert it completely into the flywheel.
5) Temporarily tighten the two screws ⑦ alternately a little at a time, then tighten them to a torque of 6kg-cm using a torque driver (VHJ-0014) and a 3mm bit (VHJ-0045).
6) In case the RE head is attached to the upper drum ⑤, solder the lead wires to the P.C. board. Solder the red lead wire to the R terminal, and the yellow lead wire to the Y terminal.

Note : When the upper drum has been replaced, perform a tape path adjustment as instructed in 6-4. and CH-1/CH-2 switching position adjustment of the servo circuit.

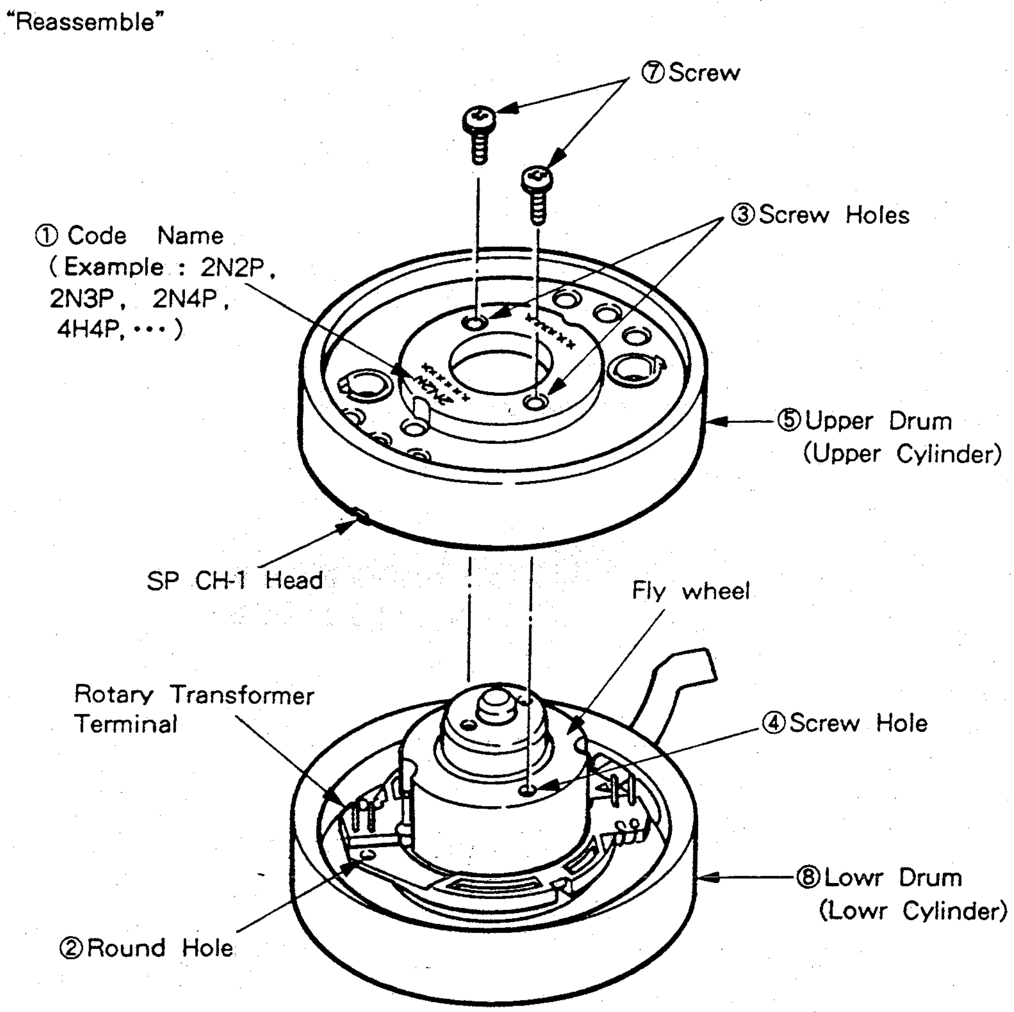
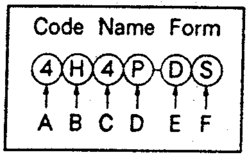

"Reassemble"
⑦Screw
① Code Name (Example : 2N2P, 2N3P, 2N4P, 4H4P, •••)
③Screw Holes
⑤Upper Drum (Upper Cylinder)
SP CH-1 Head
Fly wheel
Rotary Transformer Terminal
④Screw Hole
⑧Lowr Drum (Lowr Cylinder)
②Round Hole

Fig. 5-11-6

3. Recognizing the SP CH-1 Head Side

No playback picture can be obtained if the video head is not wired as a pair with the rotary transformer located inside the lower drum rotating section. Therefore, mounting position should be matched when mounting the upper drum. In the P88 mechanism series, the code name of the drum is printed on the SP CH-1 (CH-A, plus azimuth) side as a mark for mounting the upper drum. (See Fig. 5-11-7.) This code name differs according to the drum type, but its basic form is as follows :

A = Number of head bases
B = "N" for normal audio
"H" for HI-FI audio
C = Number of heads
D = TV system ("N" or "P")


Code Name Form
4
H
4
P
D
S
A B C D E F

EF = Code for detailed classification. Depending on drum type, it can also be just one character, or a blank space.

Examples of Detailed Classification Codes
V = Head with level difference
D = Compatible with digital units
S = SVHS-compatible

Examples of Code Names
2N2P, 2N2P-L, 2N2P-V, 2N2P-D, 2N3P, 2N4P, 4H4P, 4H4P-D

Moreover, there is a round hole with marking purposes on the SP CH-1 (CH-A, plus azimuth) side of the lower drum rotary transformer terminal. As shown in Fig. 5-11-8, there are two types of rotary transformer terminals (the number of pins differs according to the number of heads).

Note : When ordering parts such as drums (CYLINDERS), do not use the code names; always refer to the parts list and order with the specified part numbers.

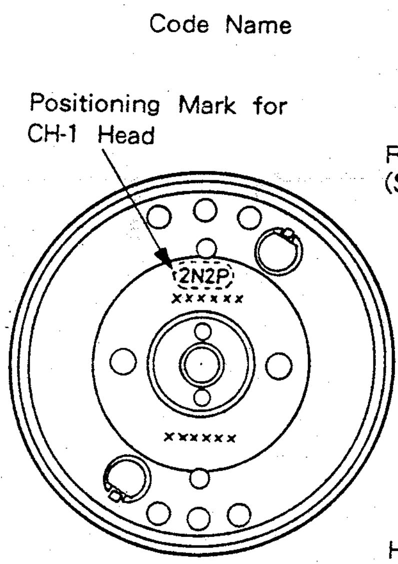

Code Name
Positioning Mark for CH-1 Head
2N2P
xxxxxx
xxxxxx

Fig. 5-11-7. Upper Drum

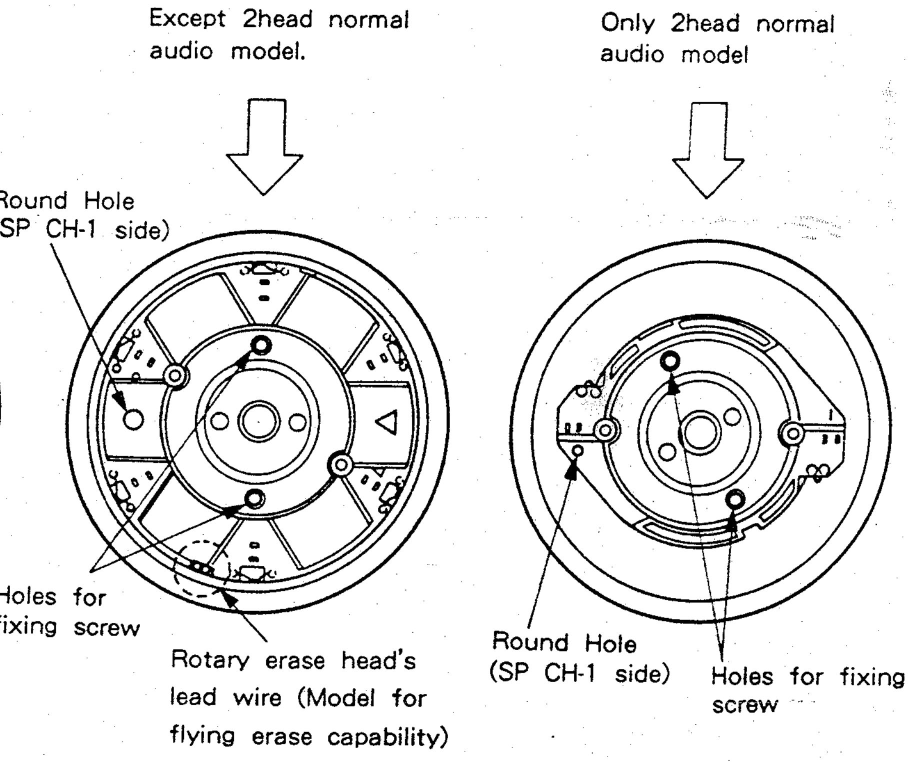
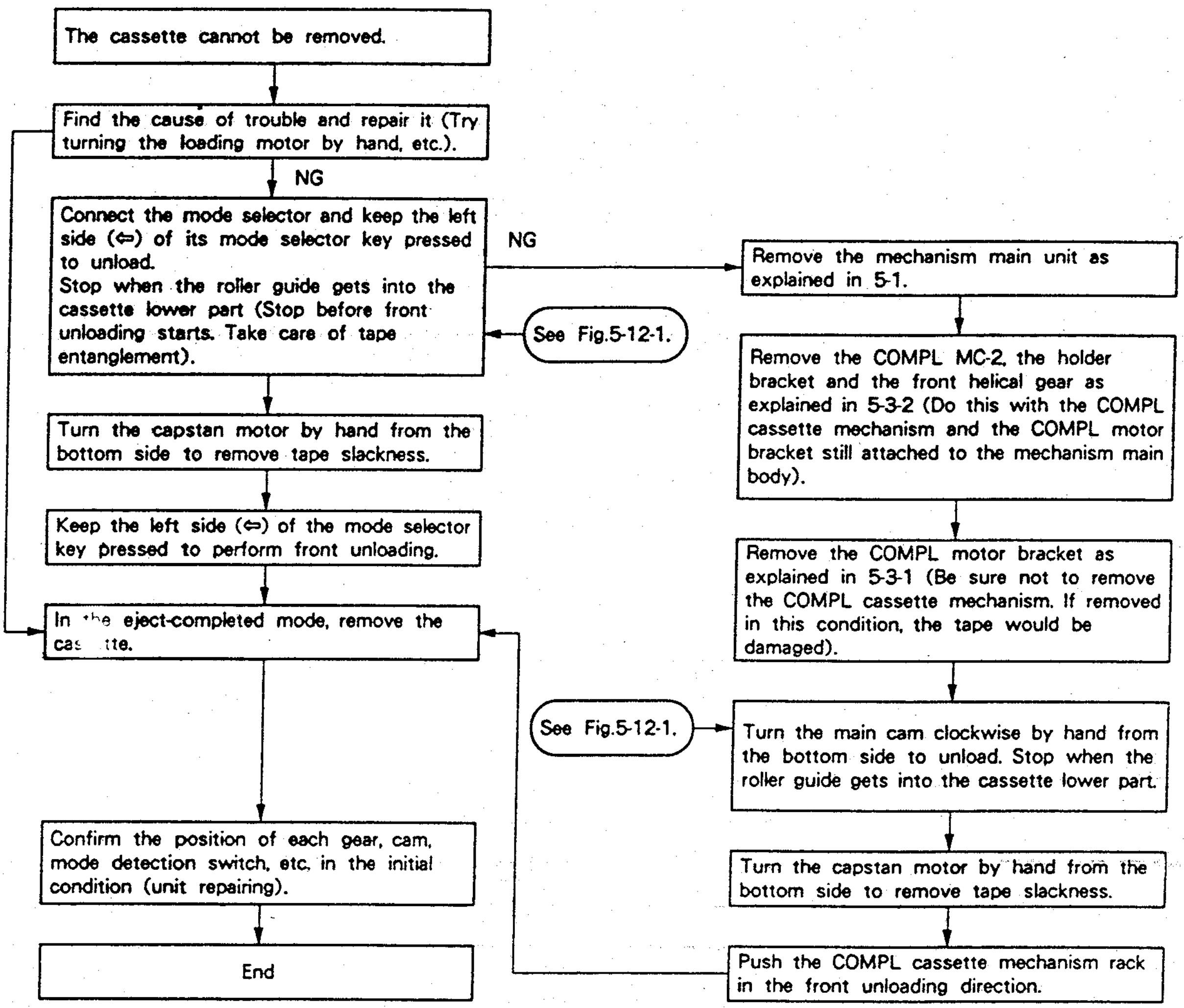

Except 2head normal audio model.
Only 2head normal audio model
Round Hole (SP CH-1 side)
Holes for fixing screw
Rotary erase head's lead wire (Model for flying erase capability)
Round Hole (SP CH-1 side)
Holes for fixing screw

Fig. 5-11-8. Lower Drum

5-12. HOW TO PROCEED WHEN THE CASSETTE CANNOT BE REMOVED


The cassette cannot be removed.

Find the cause of trouble and repair it (Try turning the loading motor by hand, etc.).

NG

Connect the mode selector and keep the left side (⇐) of its mode selector key pressed to unload.
Stop when the roller guide gets into the cassette lower part (Stop before front unloading starts. Take care of tape entanglement).

See Fig.5-12-1.

Turn the capstan motor by hand from the bottom side to remove tape slackness.

Keep the left side (⇐) of the mode selector key pressed to perform front unloading.

In the eject-completed mode, remove the cassette.

Confirm the position of each gear, cam, mode detection switch, etc. in the initial condition (unit repairing).

End

NG

Remove the mechanism main unit as explained in 5-1.

Remove the COMPL MC-2, the holder bracket and the front helical gear as explained in 5-3-2 (Do this with the COMPL cassette mechanism and the COMPL motor bracket still attached to the mechanism main body).

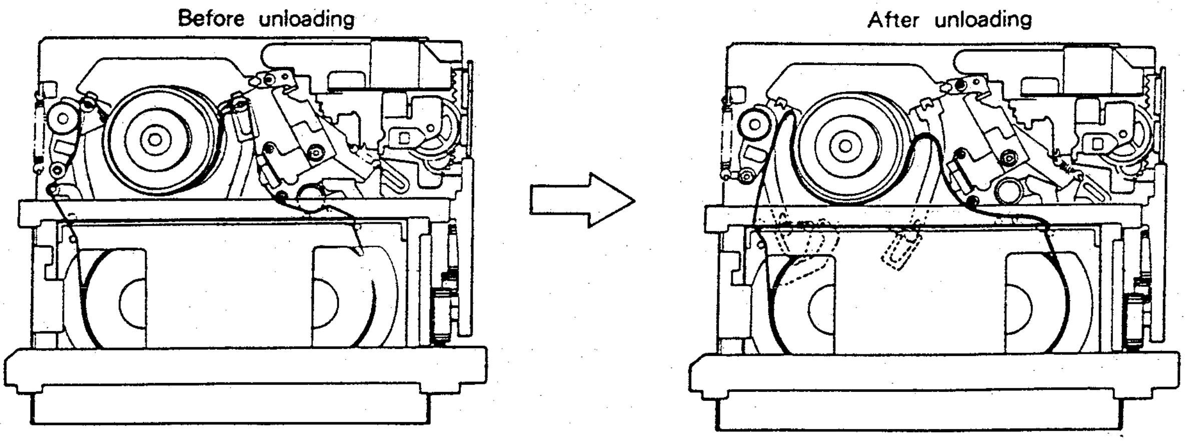
Remove the COMPL motor bracket as explained in 5-3-1 (Be sure not to remove the COMPL cassette mechanism. If removed in this condition, the tape would be damaged).

See Fig.5-12-1.

Turn the main cam clockwise by hand from the bottom side to unload. Stop when the roller guide gets into the cassette lower part.

Turn the capstan motor by hand from the bottom side to remove tape slackness.

Push the COMPL cassette mechanism rack in the front unloading direction.


Before unloading

After unloading

Perform unloading using the mode selector.

First rotate the capstan motor by hand from the bottom to take-up the tape slack, and perform front-unloading using the mode selector.

Fig. 5-12-1

6. MECHANISM ADJUSTMENT

6-1. OPERATING THE MECHANISM WITH NO CASSETTE INSERTED (See Fig. 6-1-1.)

1) Attach black vinyl tape to the T. END and T. TOP sensors to prevent light from entering.
2) Push the TRAY LOCK LEVER in the direction of the arrow to maintain the unlocked condition. Release the lever just before the TRAY starts moving down.
3) In this condition, operation is possible in every mode. However, the following procedures are necessary to operate the unit in the REC, REW and R-SEARCH modes.

REC mode :	Push the SAFETY SW LEVER to turn the SAFETY SWITCH (Erasure Prevention Switch) ON, then press the REC button. If the SAFETY SWITCH is not turned ON, the unit will enter the EJECT mode.
REW/R-SEARCH :	After pressing the REW button, turn the TAKE-UP REEL ASS'Y by hand. Otherwise, the reel sensor will operate, setting the INITIAL mode after 2 to 3 seconds.

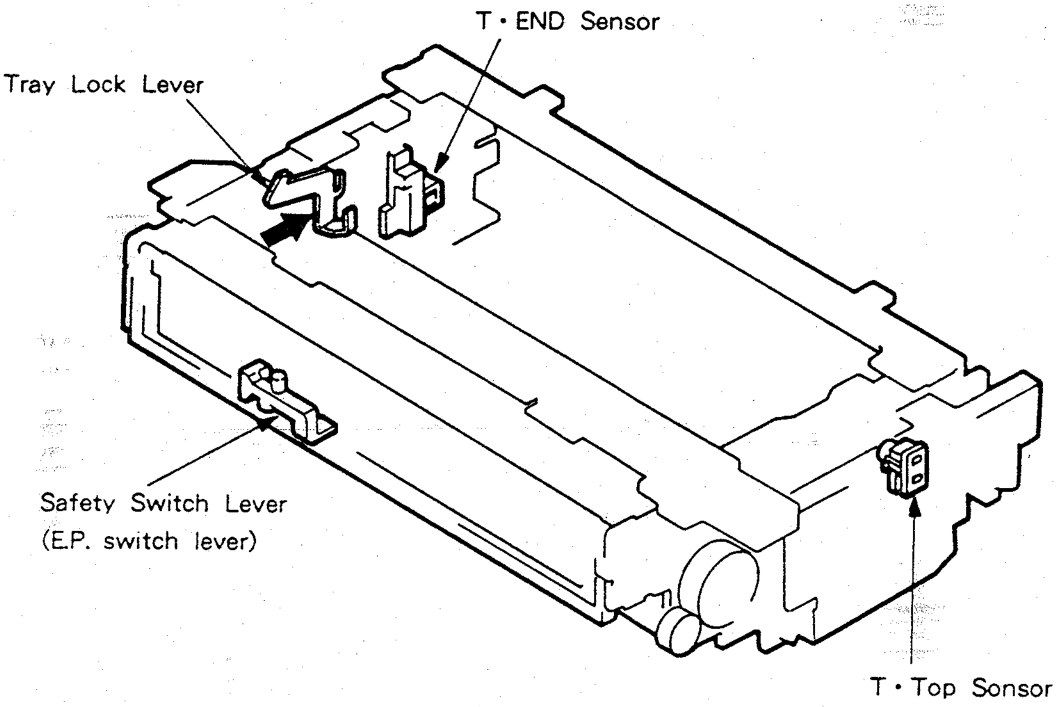


Fig. 6-1-1. Preparations for Adjustment

6-2. REEL TABLE HEIGHT ADJUSTMENT AND TORQUE CHECK

6-2-1. Reel Table Height (See Fig. 6-2-1.)

If the SUPPLY REEL ASS'Y or the TAKE-UP REEL ASS'Y is replaced, it will be necessary to adjust the REEL TABLE height.

(1) Remove the COMPL CASSETTE MECHANISM as instructed in 5-2-1.
(2) Attach the cassette stand plate gauge (VHJ-0001) and slide the gauge in the direction of the arrows.
(3) Confirm that, when the gauge stops, the REEL TABLEs are not in contact with surface A of the plate and are in contact with surface B.
(4) If the REEL TABLE is in contact with surface A, remove a spacer and check again.
(5) If the REEL TABLE is not in contact with surface B, add a spacer and check again.
(6) Remove the cassette stand plate gauge.
(7) Set the EJECT mode with the mode selector.
(8) Mount the COMPL CASSETTE MECHANISM as instructed in 5-2-1.

Note :

- Adjust the reel table height by adding or removing spacers (0.13t, 0.25t, 0.3t, 0.4t and 0.5t) as appropriate so that the height meets the specifications. Use the same method for both the TAKE-UP REEL TABLE and the SUPPLY REEL TABLE.
  (The 0.5t washer is included as the standard washer for the SUPPLY REEL ASS'Y. The 0.4t washer is included as the standard washer for the TAKE-UP REEL ASS'Y.)
- If the height of the reel table is not within the specified value, the tape edge might be damaged as a result, or the tape path adjustment might not be possible to make.

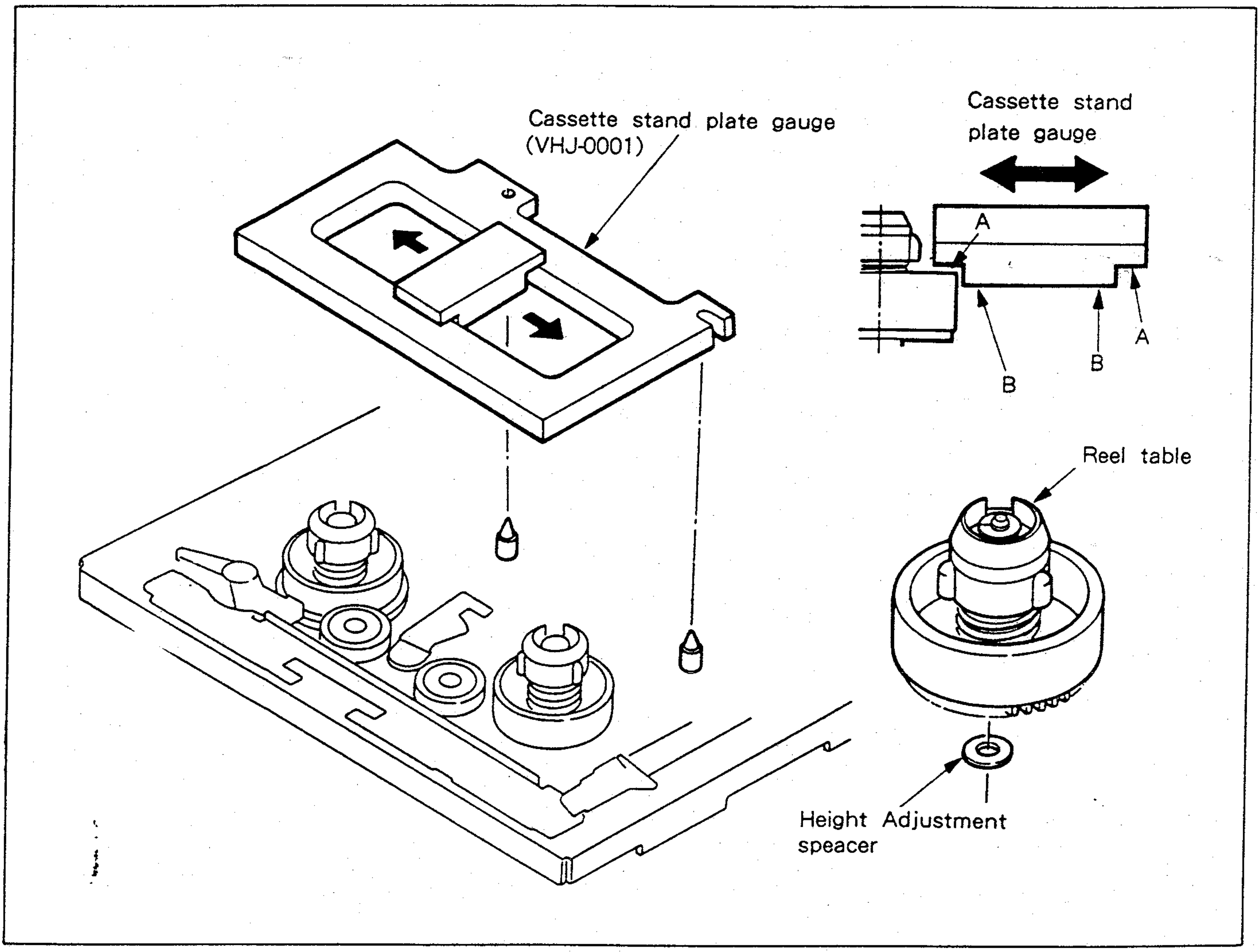


Fig. 6-2-1 . Reel Table Height Adjustment

6-2-2. Torque Check (See Fig. 6-2-2.)

1) Set the unit to operating condition without a cassette inserted as instructed in 6-1.
2) Measure the SUPPLY REEL TABLE torque in the REW mode, and confirm that it is 600gcm or more. Perform this measurement keeping the torque gauge in a fixed position with your hand (locked torque).
3) Measure the TAKE-UP REEL TABLE torque in the F.FWD mode, and confirm that it is 600gcm or more (locked torque).
4) Measure the TAKE-UP REEL TABLE torque in the playback mode (SP tape speed), and confirm that it is within 80 through 150gcm (locked torque).
5) After confirming that torque readings are within the specifications for each mode, check the following :
   - ⓐ Dirt on the capstan motor and the REEL PULLEY groove.
   - ⓑ Deterioration of the REEL DRIVE BELT.
   - ⓒ Deterioration of the FRICTION GEAR ASS'Y felt (torque during playback).
   - ⓓ Wear and damage of the COMPL CLUTCH MECHANISM and the reel drive system gears.

Note : Items ⓑ, ⓒ and ⓓ require replacement if found defective.

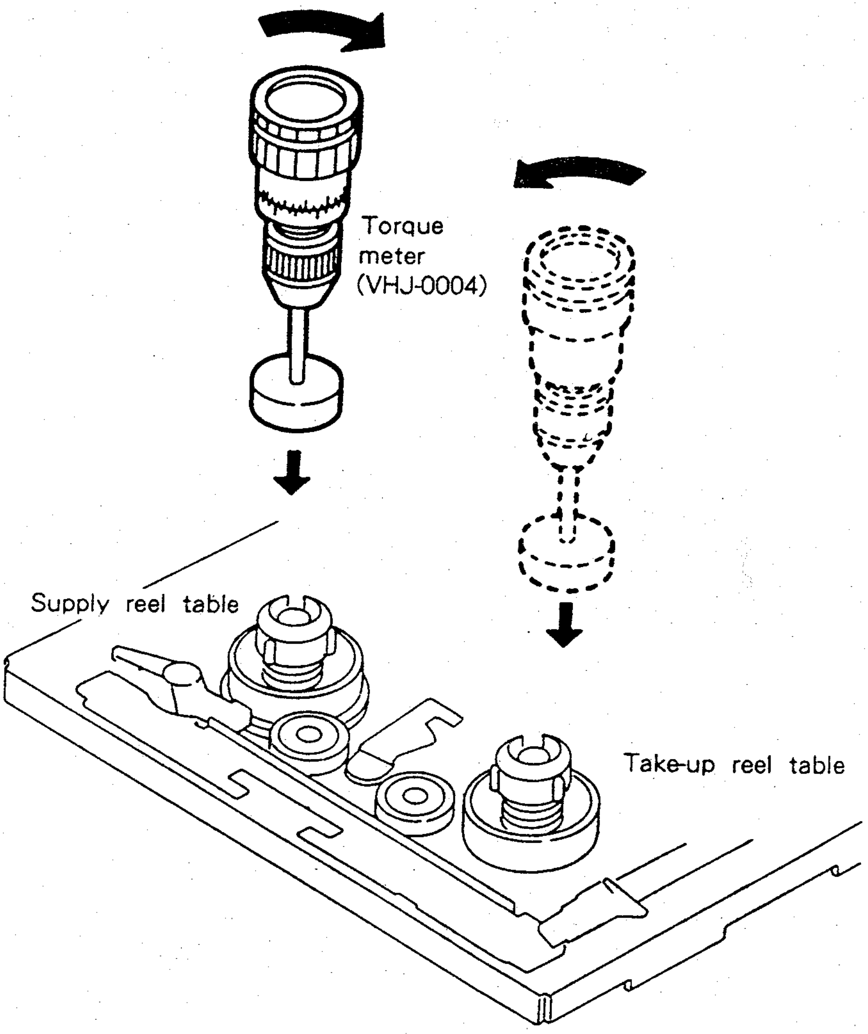


Fig. 6-2-2 Checking REW/FF/PLAY Torque

6-3. TENSION POLE (BACK TENSION GUIDE) POSITION ADJUSTMENT AND BACK TENSION TORQUE CHECK

6-3-1. Tension Pole (Back Tension Guide) Position Adjustment (See Fig. 6-3-1.)

1) Remove the COMPL CASSETTE MECHANISM as instructed in 5-2-1.
2) Set the PLAY mode with the mode selector (VHJ-0050).
3) Attach the position adjustment gauge (VHJ-0049) ①.
4) Confirm that the tension pole ② is within the position adjustment gauge frame.
5) In case the tension pole is not within the above-mentioned frame, adjust it by loosening the screw ④ a little and changing the mounting position of the BAND HOLDER ⑤ in the direction of the arrow Ⓐ.
6) Remove the position adjustment gauge ①.
7) Set the EJECT mode with the mode selector.
8) Mount the COMPL CASSETTE MECHANISM as instructed in 5-2-1.
9) Confirm that back tension torque is within 42 ± 5gcm, as instructed in 6-3-2 below.

6-3-2. Back Tension Torque Check (See Fig. 6-3-1.)

1) Attach the cassette torquemeter (VHJ-0016) and set the PLAY mode.
2) Confirm that back tension torque is within 42 ± 5gcm.
3) In case back tension torque does not meet the above specification, proceed as follows :

ⓐ Clean the portion where the brake band (BAND HOLDER ASS'Y) ⑦ of the SUPPLY REEL ASS'Y ⑥ makes contact.

ⓑ Confirm that the brake band of the BAND HOLDER ASS'Y ⑦ does not make wear and that it is clean. If wear or dirt is found, replace the band holder assembly ⑦ as instructed in 5-7-3.

ⓒ Replace the TENSION LEVER ASS'Y SPRING COIL ⑧.

Note : Always follow procedures in 6-3-1. Tension Pole Position Adjustment after performing ⓐ, ⓑ and ⓒ.

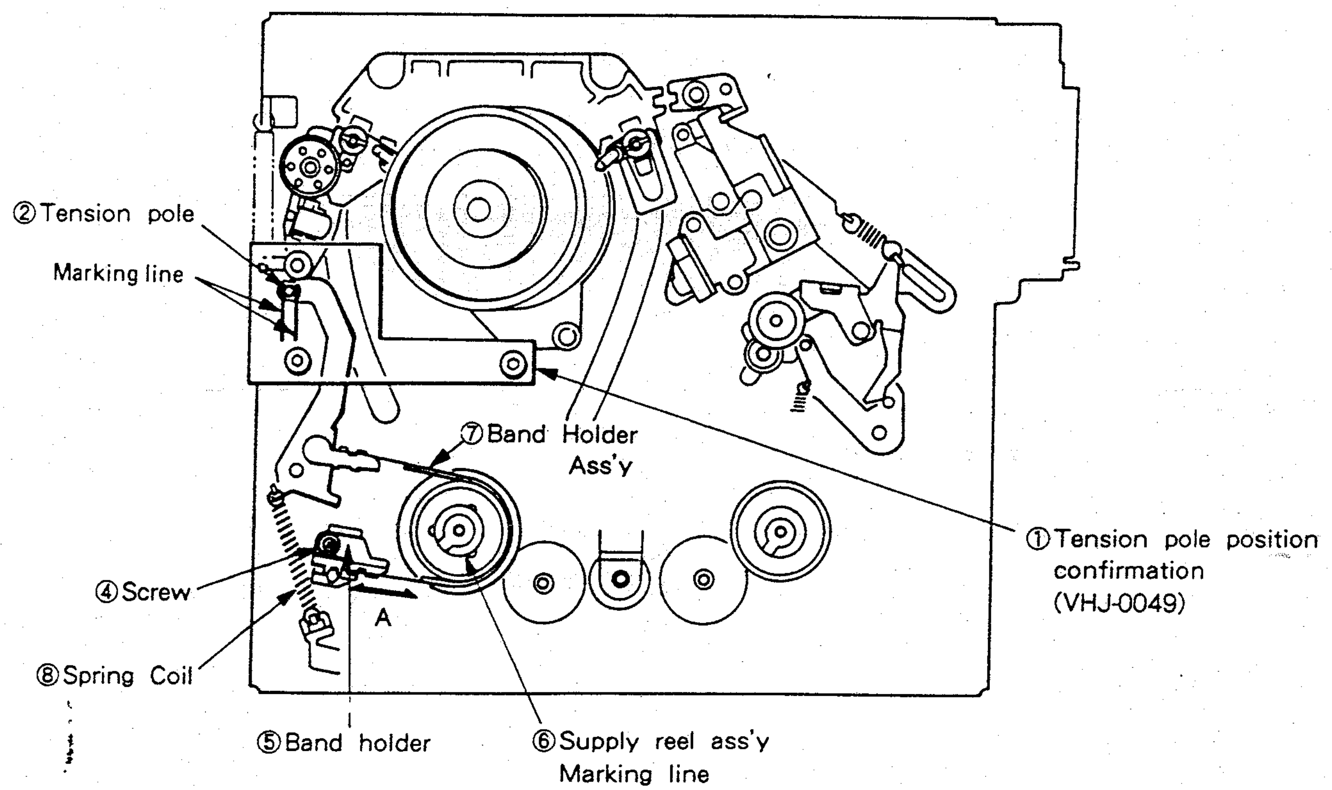


Fig. 6-3-1. Tension Pole Positioning Adjustment

6-4. TAPE PATH ADJUSTMENT

The tape path mechanism is precisely adjusted at the factory. Normally no readjustment is required, but checking and/or adjustment is necessary when parts of the tape path mechanism among those shown in the figure below (See Fig. 6-4-1.) have been removed or replaced after a long period of use.
This operation consists of adjusting the various guides so that the tape drawn out from the supply reel runs smoothly along the DRUM (CYLINDER) lead surface. A way of grasping the tape path condition by electronic means is monitoring the video head output envelope waveform with an oscilloscope. However, the fact that visual observation is essential in order to know whether the tape is running through the various guides in a smooth and natural way should be kept in mind when checking and adjusting.
Also remember that the position of tape guides is not greatly affected by the replacement of the UPPER DRUM (UPPER CYLINDER) or the COMPL DRUM (COMPL CYLINDER), provided that it is correctly performed, and that only the replaced parts should be adjusted after replacing a tape guide or COMPL HEAD BRACKET, since the position of the other tape guides shall not change considerably.

6-4-1. Preparations for Adjustment

(1) Clean the tape transport surfaces (See Fig. 6-4-1.).
(2) Connect the oscilloscope. Connect the channel 1 probe to the envelope waveform test point, and the channel 2 probe to the RF SW P test point. During adjustment, apply a trigger to the L side of the RF SW P in order to monitor the waveform output from channel 1 of the video head.

Note : Since oscilloscope connection points differ according to the model, refer to the "Test Point for Tape Path Adjustment" allocation figure in the electric circuit adjustment section of the service manual book.

(3) Use a dentist's mirror for visual observation of tape path condition.
(4) Use a nut box (VHJ-0048) for adjustment of the fixed guides.
(5) Use an eccentric driver (VHJ - 0003) for adjustment of the guide rollers.
(6) When adjusting height of the fixed guides, guide rollers or COMPL head bracket, turn the special nut or the upper flange clockwise to push the tape downward, and counterclockwise to make the tape rise up.

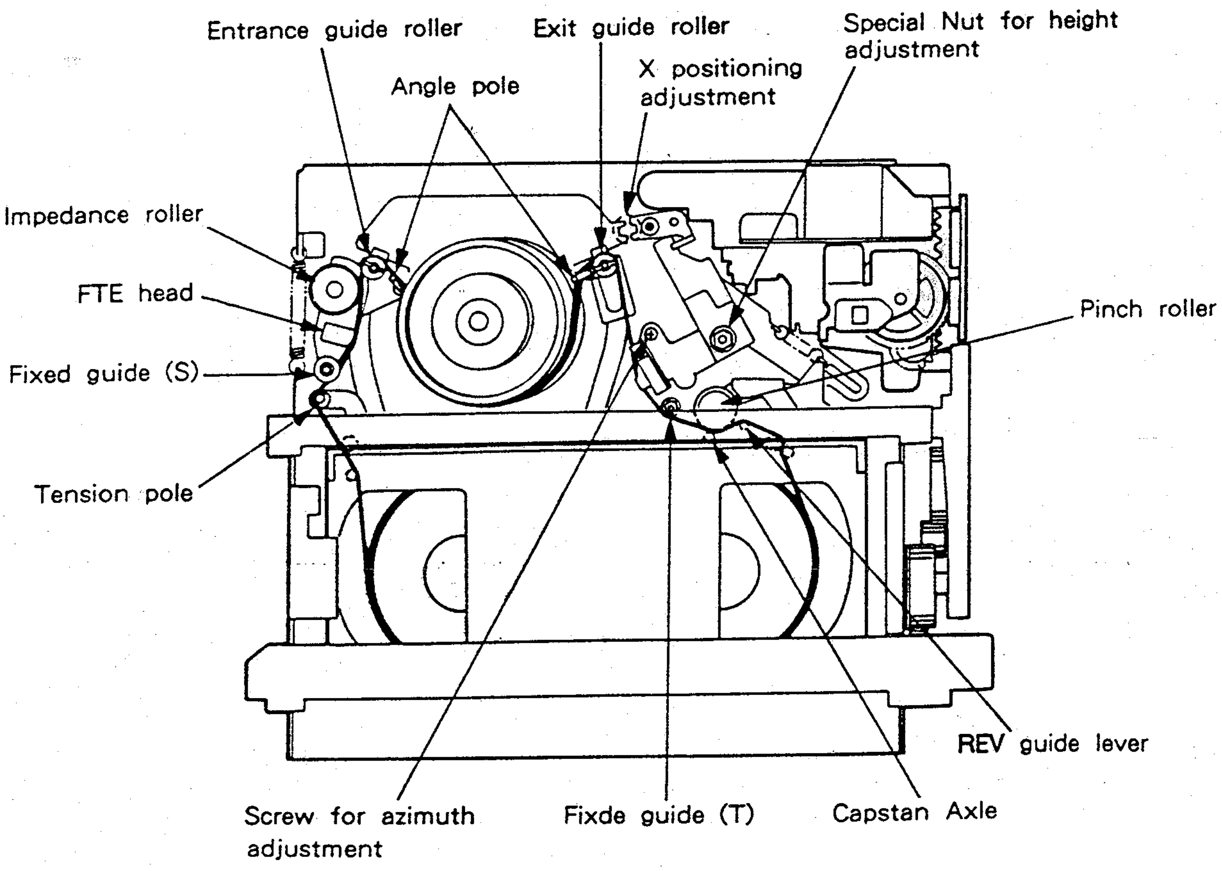

Entrance guide roller
Exit guide roller
Special Nut for height adjustment
X positioning adjustment
Angle pole
Impedance roller
FTE head
Fixed guide (S)
Tension pole
Pinch roller
REV guide lever
Screw for azimuth adjustment
Fixde guide (T)
Capstan Axle

Fig. 6-4-1 Preparation for Adjustment

6-4-2. Adjustment by Visual Observation after Guide Roller, Fixed Guide or COMPL Head Bracket Replacement

Perform this adjustment after removing or replacing any of the above parts. Only for the replaced or removed parts, play back an alignment tape (VHJ-0009) beforehand and adjust height by visual observation.

(1) Fixed Guides (See Fig. 6-4-2.)
Adjust so that the tape upper edge does not make contact with the fixed guide upper flange, and the tape lower edge does not make contact with the fixed guide lower flange. Gaps A and B should remain equal.

(2) Guide Rollers (See Fig. 6-4-3.)
The tape should not be curled by the guide roller upper and lower flanges. It should also run smoothly, without moving up and down on the DRUM (CYLINDER) lead surface.

Note : An excessive guide roller pressure may cause tape damage.

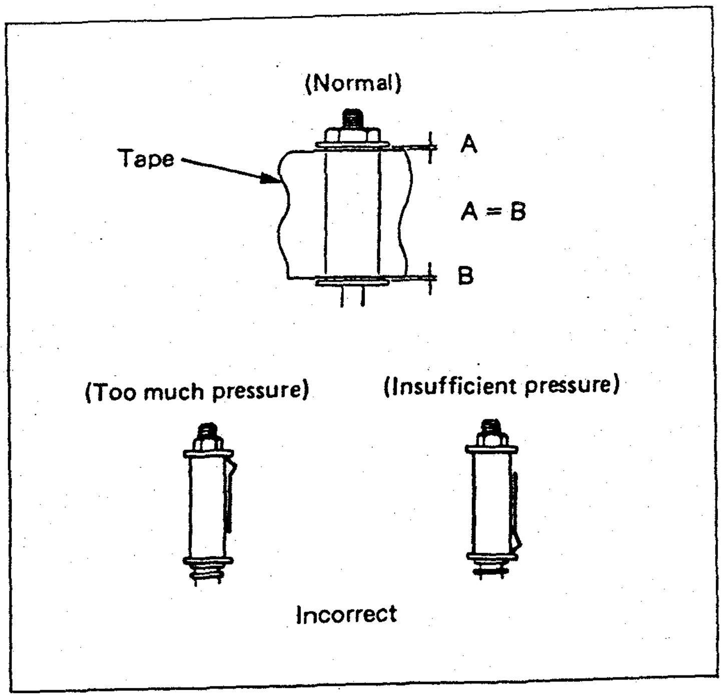

(Normal)
Tape
A
A = B
B
(Too much pressure)
(Insufficient pressure)
Incorrect

Fig. 6-4-2 (1) Pre-set for Fixed Guide

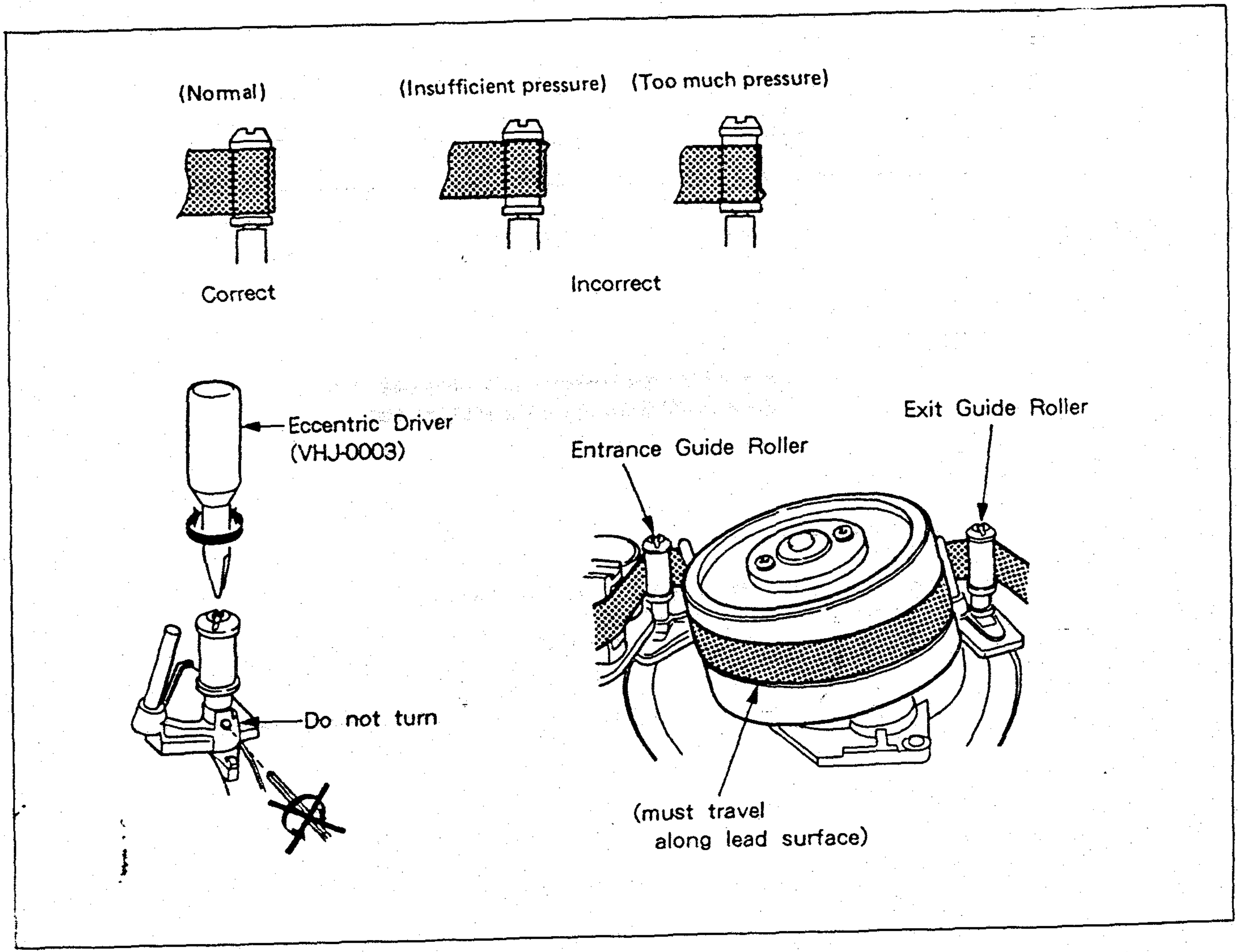

(Normal)
(Insufficient pressure)
(Too much pressure)
Correct
Incorrect
Eccentric Driver (VHJ-0003)
Do not turn
Entrance Guide Roller
Exit Guide Roller
(must travel along lead surface)

Fig. 6-4-3 (2) Pre-set for Guide Roller

(3) COMPL Head Bracket (ACE Head) (See Fig. 6-4-4.)

Adjust the special nut so that the tape edge runs between the audio head upper end and the control head lower end. Gaps A and B should be of about the same width. Since at this point it is only required that the control signal is picked up and the servo circuit works normally, no adjusting screws except the COMPL head bracket special nut should be touched.

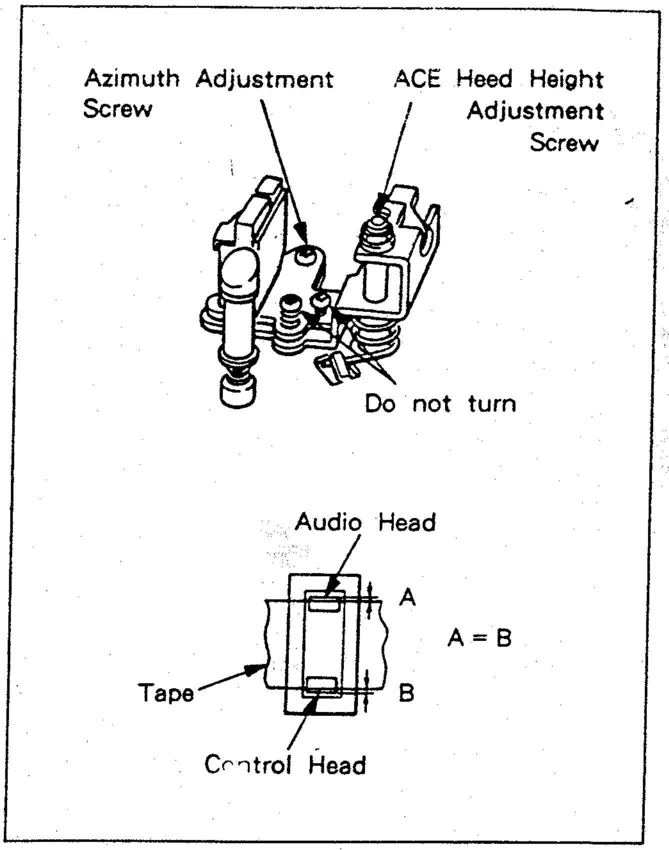


Fig. 6-4-4 (3) Pre-set for Compl Head Bracket

6-4-3. Entrance Side Fixed Guide (S) Height Adjustment (See Fig. 6-4-5.)

1) Rotate the fixed guide (S) counterclockwise to lift the tape somewhat, then insert the fixed guide height gauge (VHJ-0053) into the lower side of the fixed guide (S) lower flange.
2) Rotate the fixed guide (S) special nut clockwise a little at a time until the lower flange makes contact with the upper surface of the fixed guide height gauge, causing a slight drag.
3) After rotating the special nut 90° counterclockwise, remove the fixed guide height gauge.
4) After adjusting the guide rollers in section 6-4-2, play back the alignment tape (VHJ-0009). Confirm that the tape lower edge runs in close contact with the fixed guide (S) lower flange. In case too much pressure has left a gap between the tape and the lower flange, or excessive lifting has caused curling of the tape lower edge, perform fine adjustment. However, do not adjust the special nut beyond 90° clockwise and 45° counterclockwise.

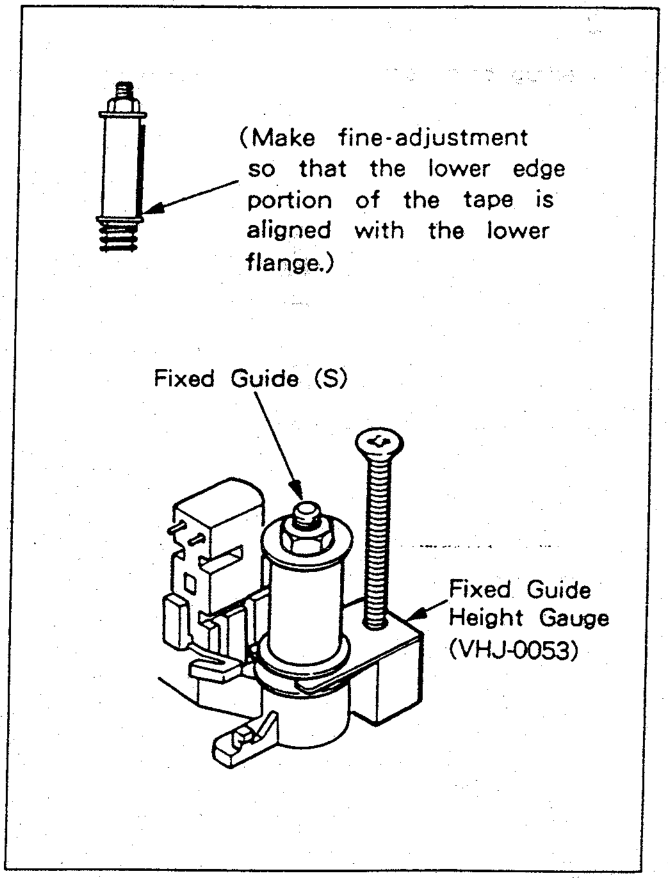

(Make fine-adjustment so that the lower edge portion of the tape is aligned with the lower flange.)

Fig. 6-4-5

6-4-4. Guide Roller Adjustment (See Fig. 6-4-6.)

1) Play back the alignment tape (VHJ-0009), press the tracking control key and adjust the envelope waveform to the maximum level.
2) Loosen the entrance and exit guide rollers by rotating them counterclockwise, then rotate them clockwise alternately until they are fastened and a flat video output waveform is obtained.
3) Confirm that the envelope waveform is not deformed, and check visually that no curling occurs at the guide roller upper and lower flanges.
4) Press the tracking control key and set the envelope waveform level to approx. 50% of the maximum. In this condition, confirm whether the envelope waveform is flat. It will not, showing valleys or peaks at the first half (entrance) or second half (exit), if the guide roller pressure is excessive or insufficient.
In case there is unevenness in the first half (entrance), adjust the entrance side guide roller. If the second half (exit) shows trouble, adjust finely the exit side guide roller.

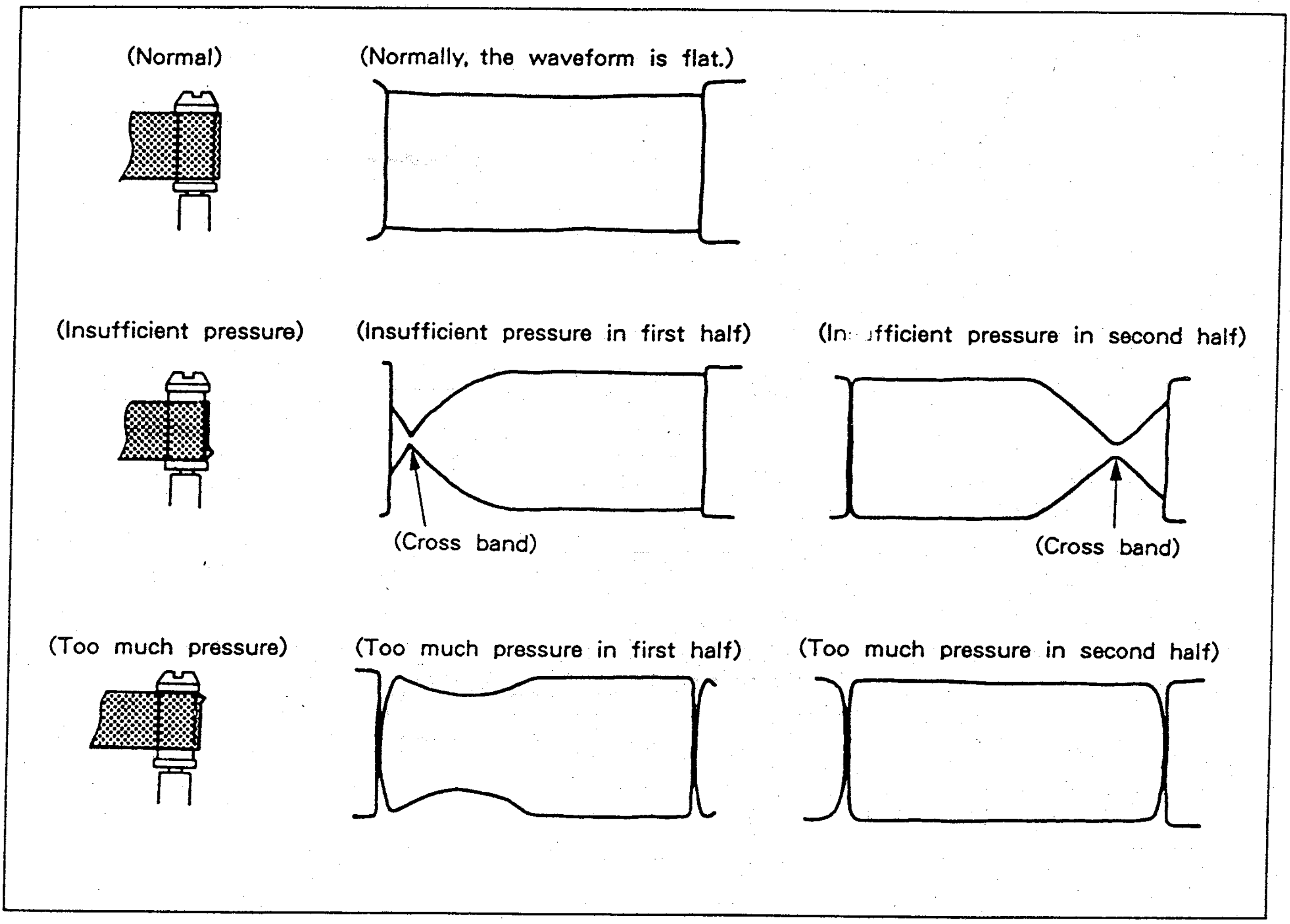

(Normal)
(Normally, the waveform is flat.)
(Insufficient pressure)
(Insufficient pressure in first half)
(Insufficient pressure in second half)
(Cross band)
(Cross band)
(Too much pressure)
(Too much pressure in first half)
(Too much pressure in second half)

Fig. 6-4-6 Guide Roller Adjustment

6-4-5. Exit Side Fixed Guide (T) Adjustment (See Fig. 6-4-7.)

1) Load the alignment tape (VHJ-0009) and set the PLAY mode.
2) Rotate the special nut counterclockwise so that the lower flange lifts the tape until its lower edge is slightly curled.
3) Rotate the special nut clockwise a little at a time until curling of the tape lower edge is removed.
4) Confirm at each mode (PLAY, F.SEARCH, R. SEARCH, F.F and REW) that the tape runs along the lower flange and that no curling occurs.

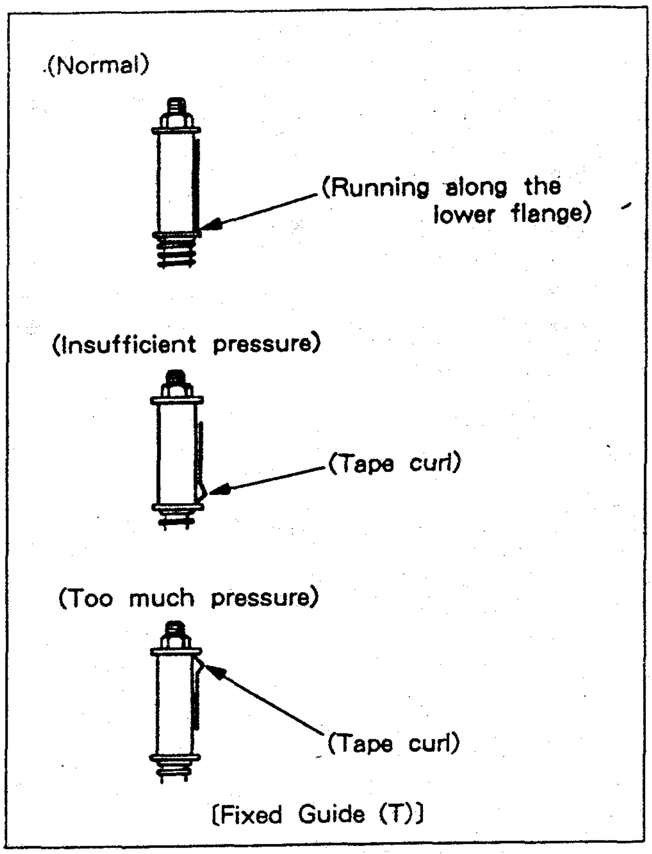

(Normal)
(Running along the lower flange)
(Insufficient pressure)
(Tape curl)
(Too much pressure)
(Tape curl)
[Fixed Guide (T)]

Fig. 6-4-7

6-4-6. COMPL Head Bracket (ACE Head) Adjustment

(1) Height Adjustment and Azimuth Adjustment (See Fig. 6-4-8.)

1) Load the alignment tape (VHJ-0009) and set the PLAY mode.
2) Monitor the audio output waveform with the oscilloscope.
3) Rotate the azimuth adjustment screw until the audio output waveform amplitude is maximum.
4) After loosening the ACE head height adjustment special nut, rotate it slowly clockwise until amplitude of the audio output waveform is maximum, then adjust it finely clockwise to the point just before the said waveform amplitude begins to decrease.
5) Rotate the azimuth adjustment screw until amplitude of the audio output waveform is maximum.
6) Confirm that the audio output waveform amplitude does not fluctuate.

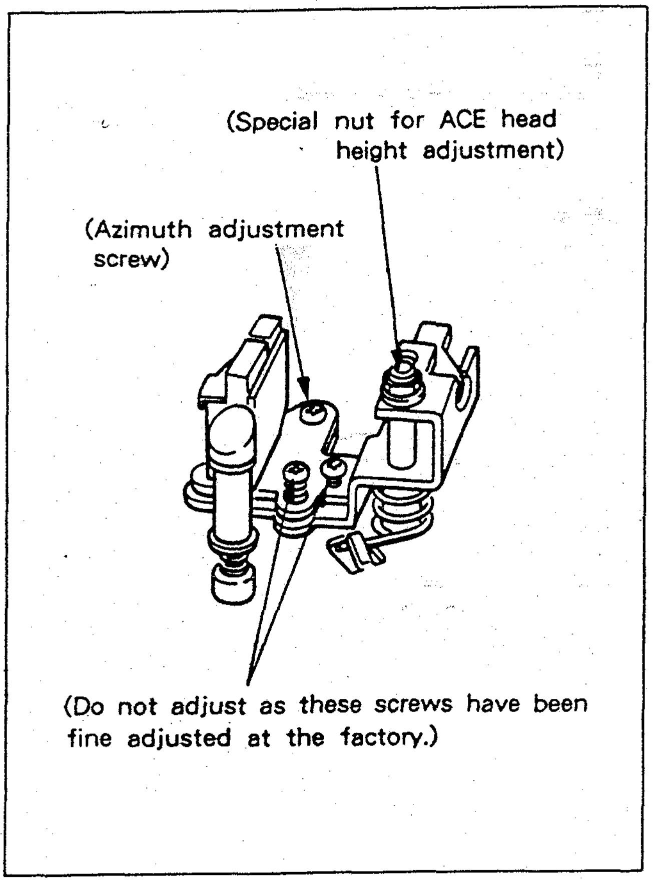

(Special nut for ACE head height adjustment)
(Azimuth adjustment screw)
(Do not adjust as these screws have been fine adjusted at the factory.)

Fig. 6-4-8

(2) Tracking (X Value) Adjustment (See Fig. 6-4-9.)

1) Load the alignment tape (VHJ-0009) and set the PLAY mode.
2) Set tracking to the center position with the tracking control key (See Note below).
3) Rotate the stopper bracket fixing screw 180° counterclockwise.
4) Monitor the video head output envelope waveform with the oscilloscope.
5) Adjust the stopper bracket position so that amplitude of the envelope waveform becomes maximum at the tracking center and the envelope waveform amplitude changes by the same amount when shifting the tracking center by pressing the plus (+) and minus (−) tracking control keys.
6) Tighten the fixing screw.
7) Perform servo circuit channels 1/2 switching position adjustment (refer to Electrical Adjustment).

Note : For models equipped with auto tracking, always set to the manual tracking mode before adjustment. To confirm the tracking center position, press the tracking keys (+, −) and observe the front panel clock display. It will read "T − : −" at the tracking center, "T − : , T − − : " when keeping the minus (−) key pressed, and "T : −, T : − −" when keeping the plus (+) key pressed. The time indication will be restored 2 to 3 seconds after the tracking keys are released.

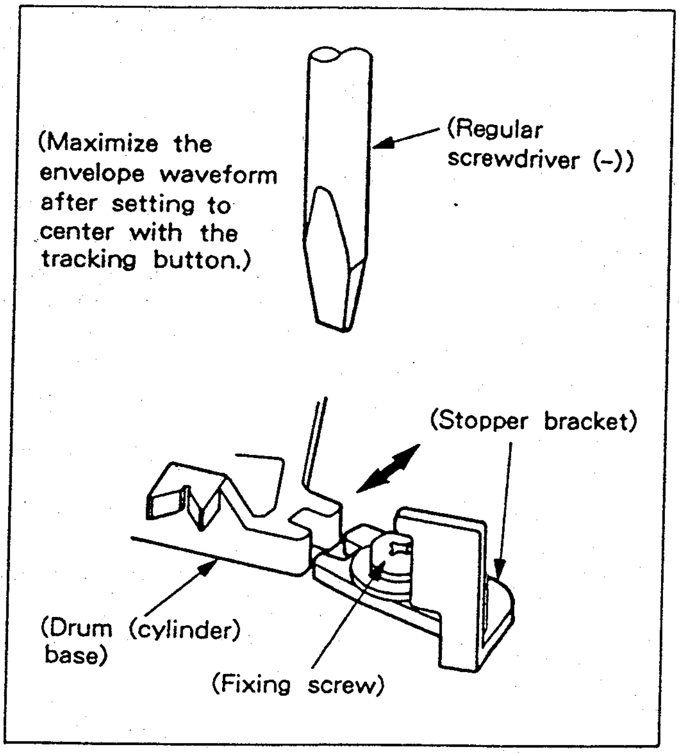

(Maximize the envelope waveform after setting to center with the tracking button.)
(Regular screwdriver (−))
(Stopper bracket)
(Drum (cylinder) base)
(Fixing screw)

Fig. 6-4-9

6-4-7. Checking after Adjustment

1) Play back the alignment tape (VHJ-0009) and confirm that the envelope waveform rise immediately, and that there is no fluctuation in the envelope and audio output waveforms.
2) Load an E-180 cassette, record it and play it back. Then, confirm again that the envelope waveform rise immediately, and that there is no fluctuation in the envelope and audio output waveforms (during recording, input a 1kHz signal to the audio input terminals. Be sure to use an unspoiled E-180 cassette).
3) Set the PLAY mode, then turn power OFF (INITIAL mode) and set the PLAY mode again. Confirm that the envelope waveform rise immediately. Also check that the tape is not bent around the pinch rollers.
4) Confirm that the envelope waveform rise immediately, after changing from the FF, REW, F.SEARCH and R.SEARCH modes into PLAY. Also check that the tape is not bent around the pinch rollers.
5) Confirm that no tape curling or sliding-up occurs at the upper and lower flanges of the tape guides in the PLAY, FF, REW, F.SEARCH and R. SEARCH modes.
6) In the PLAY mode, confirm that the tape runs as shown in Fig. 6-4-10.

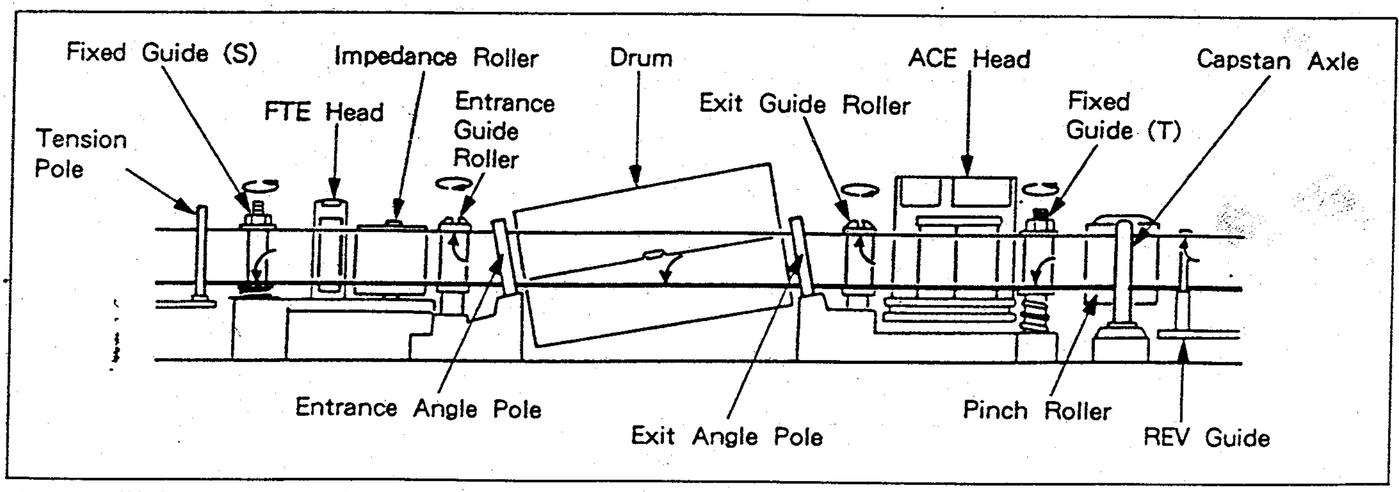

Fixed Guide (S)
Impedance Roller
Drum
ACE Head
Capstan Axle
Tension Pole
FTE Head
Entrance Guide Roller
Exit Guide Roller
Fixed Guide (T)
Entrance Angle Pole
Exit Angle Pole
Pinch Roller
REV Guide

Fig. 6-4-10